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The
"Kingway"



Service
Series

Some Lectures and Notes on Machine Guns

By
MAJOR N. K. CHARTERIS
Instructor, School of Musketry,
Hythe

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PREFACE.

My idea in publishing this book on Machine Guns is to assist Officers in training Machine Gunners, and to amplify the information contained in the official handbooks.

The subjects dealt with in this little book are explained in full detail, and diagrams are given. It is hoped that the book will prove of some use to those of the new armies who have come forward so nobly to assist their country in the present crisis.

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Southern Command, S. of M.,
Hayling Island.

July, 1915.

*[The publication of this book has been
sanctioned by the War Office.]*

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CHAPTER I.

HISTORY, ORGANIZATION AND TRAINING.

Machine Gun Sections form an integral part of the battalions to which they belong, therefore it is necessary for all officers to know something about them and their uses, to enable them to realize:—

- (a) The kind of task to allot them;
- (b) The kind of assistance to expect from them.

From, one might say, time immemorial, it seems to have been the desire of warlike nations, to invent some sort of weapon whereby the fire power of one man might be increased in excess of anything that it was possible for him to produce with his ordinary weapon.

I believe that even in the days of bows and arrows an attempt was made in this direction.

At the battle of Hastings there was some sort of bow which was designed to fire more than one arrow at a time. What results were obtained I cannot tell. Then in the early days of firearms, various attempts were made, with the idea of enabling one man to produce a large volume of fire. In 1661 a man called William Drummond tried a

number of barrels tied together. His idea must have been very similar to methods adopted by the British Army on the block-house lines, during the last South African War, when six or eight rifles were fixed side by side, and so arranged, with a rod of some kind passed through the trigger guards, that they could all be fired simultaneously by one man. Rifle batteries of a similar nature have been used in the present European War.

In the fourteenth century, in England, multiple barrelled weapons were produced, but the number of barrels was limited owing to weight, to the time required to reload, and to the primitive methods adopted for supporting them while firing, they were never any good.

In 1861 came the Gatling Gun. It had from 4 to 10 barrels and was hand operated. The mechanism was complicated and jams were frequent. However, it was the first gun to produce continuous fire. Then in 1866 came the "Mitrailleuse." This had 25 or 37 barrels, according to type. It was used by the French in the Franco-German War of 1870-1871. The French had kept it a great secret, but it failed in this war because its proper uses were not understood. It was used as an artillery weapon and manned by gunners, not by infantry or cavalry, and the result was that it was only used at long ranges.

At this time the German rifles were only sighted up to 700 yards, while the French

rifle and the Mitrailleuse were sighted up to 1,400 yards. Had it been realized by the French that it was an infantry weapon it might probably have given good results.

Next came the Gardner and Nordenfeldt, both hand operated.

In 1883, the Maxim was invented, and was the first automatic gun; it came into our service in 1886, and after all these years the principle remains the same to-day, and has stood the test of time, both in peace and war all over the world.

The latest gun, namely, the "Vickers," weighs only $27\frac{1}{2}$ lb. as against the 60 lb. of the Maxim; the reduction in weight has been attained by substituting steel for gunmetal. The Lewis air-cooled gun is now in use in our Army, and also the Colt.

Machine guns have been used in small and other wars in Egypt, India and Africa, etc.

After the South African War, Germany started to seriously study machine guns, considering especially as regards their use to assist cavalry dismounted action.

The South African War brought out the necessity for training mounted troops to combine fire action with shock tactics. Further it was realized that the nature of the mobility of mounted troops for independent action would be increased if they had a self-contained fire power.

While Germany was organizing her machine guns, the Manchurian War broke out. The

Japanese, following the German system, had at the beginning of the war 4 batteries of Hotchkiss guns, $4 \times 6 = 24$, one battery with each cavalry brigade—none with their infantry.

The Russians had one company (8 guns) intended to be used in support of their infantry. All their guns were on carriage mountings—neither Power believed much in machine guns; but as the war progressed their value became evident, and both the belligerents trained large numbers of machine gunners during the war and bought all types of guns. By the end of the war the Russians had increased to 88 machine guns, and the Japanese to 320; probably many of the 320 had been captured from the Russians.

Barbed wire and machine guns were found to be the greatest obstacles to overcome in the attack.

Many instances of the value of machine guns were chronicled during the war, and at the end of it opinion was universally in favour of them. The important part played by machine guns in the present European conflict is obvious to the most casual observer, and the necessity of well-trained gunners has been firmly established.

There are two types of machine guns:—

Recoil operated, such as the Maxim and Vickers.

Gas operated, such as the Hotchkiss and Lewis.

Out of twenty-three foreign Powers, seventeen have the Maxim gun, five have the Hotchkiss (gas), and some have both.

There are other guns such as the Schwarzslose (recoil).

ORGANIZATION.

All countries, basing the tactical employment of machine guns on their characteristics, are agreed that they should be used to closely support the arm to which they are attached; but their methods of organization and equipment vary considerably.

Three general methods of organization on the Continent:—

(1) Machine Gun Section forming an integral part of the unit; with the C.O. responsible for efficiency.

(2) Machine Gun Sections forming an integral part of each battalion or regiment, the number of sections corresponding to the number of battalions in a regiment, personnel selected from all battalions of the regiment, placed under the orders of the regimental commander, with a specially selected Officer appointed to train them. They are all quartered together—a foreign regiment is analogous to our brigade.

(3) Selection of men from groups of regiments who remain “machine gunners” all their colour and reserve service. They are trained apart, and wear a distinctive uniform—these go to form Machine Gun Companies or Detachments.

(4) The formation of a Machine Gun Corps has recently been sanctioned by H.M. the King for the British Army.

Most Powers consider the supply of ammunition so important that they have an Officer, or Warrant Officer, to command the transport carrying it.

The Continent seem to go in for what we call brigading. We really do a combination of the Section system and the brigaded system.

The Swiss have groups, six sections of 12 guns each, commanded by a Major and four subaltern officers.

EQUIPMENT.

As regards the mounting for the gun. All the great Powers have some form of tripod. Ours at present weighs 48 lbs; it is strong, reliable, inconspicuous, easily adjusted, within limits, to any height, can be used on any kind of ground, flat or sloping. In the British Army we now have a light type of tripod which can be permanently fixed to the barrel casing of a Maxim or Vickers gun, even when the gun is mounted on the Mark IV tripod, so that in a rapid advance the gun and light tripod complete can be rushed forward into position, leaving the heavier Mark IV tripod to be brought forward later. The shooting from this light tripod is not, of course, so accurate as from the Mark IV tripod, as there is no

elevating gear attached to it; but for rough and hasty shooting, it is of great service.

Germany and one or two of the small Powers have a sledge. For cavalry its weight is 110 lbs, and for infantry 53 lbs.

The gun is mounted permanently on it and can be fired from the limbered wagon. It is of little use on steep slopes. Ourselves and France alone have the "all round traverse." We consider this characteristic a most valuable one, enabling fire to be quickly turned on in any direction without disturbing the platform.

The Russian tripod, Colonel Sokolov's pattern, has wheels fitted to it; these come into use when tripod is folded up. It also has a shield, width 21 inches, height 19 $\frac{3}{4}$ inches, weight 19'86 lbs.

Austria also has a shield weighing 86 lbs. Since we gave up the old wheeled carriage, we have also dispensed with any kind of shield; their visibility and weight render them of little value, and in any case they could only afford protection from the front and then only to the firer and part of his body.

Another item of equipment which is still being experimented with is the condenser; it is important to prevent the escape of steam giving the gun position away, and the present type of condenser certainly does this, but I do not think we have reached finality in this

direction yet. The Russians use what they call an exhaust steam hose. Our present condenser may be simplified in the course of time.

Lamps for night firing form part of our equipment, but the box for holding the lamp when in use at night does not appear to be an article of issue yet.

One could easily be made on service from a biscuit tin, etc.

Other items of equipment that you all ought to be familiar with are:—

(a) The contents of your spare part boxes;

(b) The contents of your limbered wagons.

For instance, in your limbered wagons you have the following useful implements:—

Taking the fore and hind portions together:

Pick axes, 2.

Shovels, 2.

Bill hooks, 2.

Cans containing lubricating oil, 4.

(Use oil from these for first oiling up, to save that in the handles for use in action).

Drums—3 gallons water, 2.

Sand bags, 30.

Belt filling machine and spare parts for same.

Luggage saddle to enable team to be used with shaft draught vehicles on emergency.

Abney levels and clinometers.

TRANSPORT.

There are two kinds, wheeled and pack, wheeled by Great Britain, Germany and France for cavalry. For our cavalry we carry pack saddlery in the limbered wagons so that either wheeled or pack transport can be used.

Section officers with mounted troops should remember to train their sections in the use of this pack transport.

TRAINING.

The personnel of a Machine Gun Section should be changed as little as possible.

The Section is always at the disposal of the M.G.O. except when they fire their annual rifle course, when the whole section is attached to one company in their own battalion for this purpose. The Section is exempt from company training; a reserve section should be also trained, and also a supernumerary M.G.O. is necessary. The C.O. of a battalion is responsible for the efficiency of his machine gun section, but since he very often has not been a M.G.O. himself, and has no detailed knowledge of the gun, he generally gives his M.G.O. a pretty free hand, as regards training. This should be an encouragement to a keen M.G.O., but a C.O. should take great care in selecting a good officer for the post of M.G.O.

M.G.O.'s should submit programmes of training for their section to the C.O., and this should ensure a due proportion of time being given to the several subjects. The

drawing up of these programmes requires a lot of time, trouble and practice, to ensure no item of training being omitted.

Attention must be given to such subjects as judging distance, riding and driving (Russians are thorough in this, e.g., pulling or snatching at the reins to make the horse move forward is forbidden). Visual training, indication and recognition of targets, semaphore, use of ground and cover, observing, range-taking, etc. The whole section must be able to take ranges, but your No. 6's must be very highly trained, and able to test and adjust their instruments.

The Russians train their R.T.'s to inform the M.G.O. of ranges by signs. I would commend this idea to you, a combination of semaphore, and some of the signals used on the range might be useful.

The training should be divided up under the following general headings:—

- (1) Mechanism and Drill.
- (2) Range Practices.
- (3) Elementary Tactical Training.
- (4) Tactical Employment.
- (5) Field Practices.

NOTE.—The French frequently carry out field practices with blank ammunition, and say that lessons learnt are frequently as good as if ball ammunition had been used.

(6) Constructing cover both from fire and view.

All training must be thorough, and a lot of

patience, time and trouble is generally necessary before the M.G.O. should think of letting a young hand fire the gun with ball ammunition.

The tests of Elementary Training are intended to assist the M.G.O. in gauging the efficiency of his men. And what is very important is that when on the range, no slackness of any kind is permitted, e.g.:—

(a) Insist on all orders being repeated by the No. 1's.

(b) That the No. 2's always watch the Section Officer.

(c) That all points taught in the elementary training are attended to, e.g., loading or unloading motions correctly performed, any necessary I.A. promptly and correctly done.

(d) All points before, during and after firing must be carefully carried out, so as to render them habitual in all machine gunners.

In the elementary tactical training let your schemes err on the side of simplicity rather than on the ambitious side.

This elementary stage should not be in co-operation with other troops.

Just as a squadron or company is trained in the elementary principles of tactics, so let it be with your M.G. section.

Always bring out during training the particular characteristics of the gun which your scheme is meant to teach, and ensure, before going on to more advanced work, that

all your team thoroughly understand all the characteristics.

During the training of your gun numbers don't neglect the drivers, especially in selecting good lines of approach for their limbers; instruction in belt filling, etc.; they should always know the intention of the M.G.O. so that they can act in accordance with the tactical situation.

Give careful attention to the supply of ammunition, and the necessity of there always being communication kept up between the guns and limbered wagons with this end in view.

So much for the Section Officer; as regards the B.M.G.O., he may sometimes be afraid of interfering with the training of the sections in the brigade. First of all let him be tactful, and secondly let him remember that most C.O.'s would be very pleased to know of anything which appeared to be wrong in the training and would welcome suggestions for improvement.

B.M.G.O.'s might certainly consult with and advise the Section Officers in their Brigade on their programmes of training, and if they can promote a spirit of competition to be the best section in the brigade, their time and trouble will not be wasted. B.M.G.O.'s can also assist in drawing up tactical schemes.

Train Section Officers in fire direction, assist in drawing up field practice schemes, supervise firing practices, occasionally work their sections brigaded.

The system of fire orders in a Brigade must be the same in each section. B.M.G.O.'s may find that this subject requires their special attention, as if guns are brigaded, lack of uniformity will lead to confusion.

Exercise the sections of your brigade in simple tactical exercises, e.g., "The defence of a position," "The attack of a position."

The duties of M.G. in an advanced guard, flank guard, or rear guard, outposts, etc. In preparing these schemes, frame the various tasks to bring out definite lessons. Go over the ground very carefully yourself in the first case, and, during the exercise, go very much into detail; let no points be slurred over—it is better to finish a scheme another day than to hurry through it. Criticize carefully solutions of tasks.

A great deal can be learnt if these exercises are well carried out.

Foreign nations have now got full manuals on the subject of machine guns, and go much into detail.

We also have got full manuals on this subject. There are certainly fifteen different regulation books which section officers might wish to refer to on occasions. This seems a fair allowance.

I will give you them, and the subject roughly with which each deals.

- (1) War Establishments (annual publication):
Ammunition Allowance in war.
Transport and men,

- (2) Field Service Manual (annual publication):
Fitting of limbered wagons and their contents, also personnel.
- (3) Mobilization Regulations:
Horses, etc., war outfit.
- (4) Infantry Training: Cavalry Training:
M.G. Signals, drill, duties of gun numbers, characteristics, fire direction, general principles of employment.
- (5) Field Service Regulations, Part I:
Tactics of the gun.
- (6) Field Service Regulations, Part II:
Transport in the field, responsibility for.
- (7) Handbook of M.G.:
General description, mechanism, stoppages, etc
- (8) Musketry Regulations, Part I:
Annual course, elementary tests, ammunition allowance, wind table, reserve section.
- (9) Musketry Regulations, Part II:
Targets and range appliances.
- (10) Equipment Regulations:
Peace allowance of ball and blank ammunition. Consumable stores.
- (11) M. M. Engineering:
Entrenchments, etc.
- 12) Manual of Elementary Military Hygiene:
Sanitation of horse lines.
- (13) King's Regulations:
Inspections, command of sections, etc.

A SUGGESTED PROGRAMME FOR THE TRAINING OF MACHINE GUN SECTIONS

SUBJECT.	FIRST DAY			SECOND DAY			THIRD DAY			FOURTH DAY			FIFTH DAY			SIXTH DAY			SEVENTH DAY			TOTAL NO. HOURS EACH SUBJECT
	Manual	Section	Hours	Manual	Section	Hours	Manual	Section	Hours	Manual	Section	Hours	Manual	Section	Hours	Manual	Section	Hours	Manual	Section	Hours	
General description of Gun, Recoiling & Non-Recoiling portions, etc.	H	2-22	1	H	2-22	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Drill, Mounting and Dismounting Gun	I.T.	{ 103 (1) (2) (3) (8) & (9) }	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Lecture, "Characteristics"	I.T.	158-159	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Drill, Loading and Unloading	I.T.	103 (4) (11)	1	I.T.	103 (4) & (11)	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Mechanism	H	23-30	1	H	31-35	1	H	23-35	1	H	36-38	1	H	23-38	1	...	...	...	...	...	...	5
Care and Cleaning	H	50-55	1	H	50-55	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Drill, Laying and Sight-Setting, Loading and Unloading	I.T.	{ 103 (4) to (9) & (11) }	1	I.T.	{ 103 (4) to (9) & (11) }	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Lecture, "Allocation of Duties"	I.T.	103	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Semaphore Signals	I.T.	164	1	...	...	...	...	...	...	I.T.	164	1	...	...	...	2
Stripping of Gun, Lock, etc.	H	76 (1) to (7) & 78	1	H	{ 76 (8) (11) 78 & 79 }	1	H	{ 76 (13) (14) 78 & 79 }	1	...	...	...	...	...	...	...	...	...	3
Belt Filling; by hand and by Belt Filling machine	I.T.	104	1	I.T.	104	1	...	...	...	M.R.	642 (10)	1	...	...	...	3
Lecture, "Methods of Fire"	I.T.	163	1	...	...	...	...	...	...	...	...	...	...	...	...	1
Drill, Horizontal Traversing and Vertical Searching	I.T.	103 (10)	1	I.T.	103 (10)	1	I.T.	103 (10)	1	...	...	...	H	56 (a) to (h)	1	3
Points to be attended to before leaving Camp	{ Hythe Summary of Fire Direction }	1	...	...	...	...	...	...	...	...	...	...	1
Lecture, "Night Firing and Indirect Fire"	M.R.	58 & 66	1	1
Indication and Recognition of Targets	1
Points to be attended to before, during and after Firing	H	56-59	1	...	...	...	...	...	...	1
Immediate Action	H	{ 60-64, first 3 columns }	1	H	{ 60-64, first 3 columns }	2	...	...	...	H	{ 60-64, first 3 columns }	1	H	{ 60-64, first 3 columns }	1	7
Drill, Diagonal Traversing	I.T.	103 (10)	1	M.R.	{ 60-64, first 3 columns para. 642 (8) }	1	...	...	...	2
Spare Part Boxes shown and explained	H	73	1	...	...	...	...	...	...	1
Barrel changed; Asbestos packing	H	80 & 81	1	...	...	...	I.T.	{ 160-162 75 (4) 105 (5) }	1	1
Lecture, "Tactical Handling of M. Guns"	F.S.R.	{ 109 (2) 65-67 }	1	1
Visual Training and Judging Distance	M.R.	...	...	—
Attack and Defence Range Cards	—
Aiming Off for Wind, Explanation and Practice	—
Tests of Elementary Training	M.R.	113	1	1
Mounting and Dismounting Guns on uneven ground	Advanced Drill	1	Advanced Drill	1	...	...	2
Fire Orders I.T. 103 (5) to (9) require description of targets, etc., to be added	—
Part I. Table "C"	—
Part II. Table "C"	—
Probable causes and remedy in detail of Stoppages	—
Lecture, "Contents of Limbered Wagons and S.A.A. Cart"	—
Concealment of Guns in position shown and practised	{ Requires careful pre-arrangement }	1	...	...	...	...	...	...	...	1
Moving Guns across country by hand in various formations	—
Tactical Exercises, followed by detailed criticism	—
Exercise of M.G. Section in co-operation with 1 or more companies	—

SUBJECT	EIGHTH DAY			NINTH DAY			TENTH DAY			ELEVENTH DAY			TWELFTH DAY			THIRTEENTH DAY			FOURTEENTH DAY			TOTAL NO. HOURS EACH SUBJECT
	Manual	Section	Hours	Manual	Section	Hours	Manual	Section	Hours	Manual	Section	Hours	Manual	Section	Hours	Manual	Section	Hours	Manual	Section	Hours	
General description of Gun, Recoiling & Non-Recoiling portions, etc.	111	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Drill, Mounting and Dismounting Gun	111	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Lecture, "Characteristics"	111	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Drill, Loading and Unloading	111	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Mechanism	111	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5
Care and Cleaning	111	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Drill, Laying and Sight-Setting, Loading and Unloading	111	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Lecture, "Allocation of Duties"	111	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Semaphore Signals	111	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Stripping of Gun, Lock, etc.	111	H	79	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Belt Filling: by hand and by Belt Filling machine	H	47, 48, 49	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Lecture, "Methods of Fire"	1
Drill, Horizontal Traversing and Vertical Searching	I.T.	103 (10)	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3½
Points to be attended to before leaving Camp	1
Lecture, "Night Firing and Indirect Fire"	1
Indication and Recognition of Targets	M.R.	299 (ii)	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Points to be attended to before, during and after Firing	1
Immediate Action	H	{ 60-64, first 3 columns }	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8
Drill, Diagonal Traversing	M.R.	para. 642 (8)	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2½
Spare Part Boxes shown and explained	1
Barrel changed; Asbestos packing	1
Lecture, "Tactical Handling of M. Guns"	1
Visual Training and Judging Distance	M.R.	{ 65-67 Plate XVII }	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Attack and Defence Range Cards	I.T.	122 (4)	1	I.T.	{ Plate XVII & 122 (4) }	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Aiming Off for Wind, Explanation and Practice	M.R.	41	1	M.R.	41	1	...	...	...	...	...	...	...	...	...	...	...	...	2
Tests of Elementary Training	M.R.	113	2	...	...	...	...	...	...	...	...	...	M.R.	113	2	...	...	...	...	...	...	5
Mounting and Dismounting Guns on uneven ground	Advanced Drill			1	Advanced Drill			1	...	...	...	...	...	...	...	...	...	...	4
Fire Orders I.T. 103 (5) to (9) require description of targets, etc., to be added	I.T.	103 (5) to (9)	1	...	...	...	I.T.	103 (5) to (9)	1	I.T.	103 (5) to (9)	1	...	...	...	...	...	...	3
Part I. Table "C"	M.R.	pages 241-243	4	M.R.	pages 241-243	4	...	...	...	...	...	...	...	...	...	8
Part II. Table "C"	M.R.	pages 244-248	4	M.R.	pages 244-248	4	...	...	...	8
Probable causes and remedy in detail of Stoppages	H	{ 60-64 columns 4 & 5 & 65 }	1	H	{ 60-64 columns 4 & 5 & 65 }	1	...	...	...	...	...	...	H	{ 60-64 columns 4 & 5 & 65 }	1	...	...	...	3
Lecture, "Contents of Limbered Wagons and S.A.A. Cart"	F.S.M. Inf.	pages 37, 43, 44	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Concealment of Guns in position shown and practised	1
Moving Guns across country by hand in various formations	{ Simulating Infantry Formations }			1	...	...	{ Simulating Infantry Formations }			2	...	...	3
Tactical Exercises, followed by detailed criticism	3
Exercise of M.G. Section in co-operation with 1 or more companies	4

This Programme of Training is issued as a guide only, to assist Brigade Machine Gun Officers and Section Officers in the training of their Sections. It does not pretend to be exhaustive, or to cover the whole of Machine Gun Training. The hours of work shown against each subject are what have been proved by experience to be the minimum average number of hours required to get moderately good results.

Particular attention is drawn to Musketry Regulations, para. 641. Weather conditions will no doubt cause alterations in the programme, and it may be varied at the discretion of Officers concerned. If more than 14 days are available for training more tactical work in the field should be carried out, and any weak spots in the teams improved by repetition of the particular subjects.

Semaphore and the Training of Range Takers and Scouts should also be added. The Training Manuals referred to are: H.—303 Handbook, Maxim Gun, 1914. I.T.—Infantry Training, 1914. M.R.—Musketry Regulations, Pt. I, 1914. F.S.R.P.I.—Field Service Regulations, Pt. I, 1914. F.S.M.—Field Service Manual (Infantry). NOTE.—Troops armed with the Vickers Gun are requested to refer to the Handbook of the Vickers Gun, 1914, bearing No. 40/War Office/2129.

- (14) Field Service Pocket Book:
A summary and details of M.G.'s of
foreign armies.
- (15) Manual of Ceremonial:
Posts in formations.

TESTS OF ELEMENTARY TRAINING.

Particular attention is called to the Tests of Elementary Training, which will be found on pages 226 to 232, Musketry Regulations, 1914. Records of the testing of each man in the section must be kept and entered up on a form, a copy of which will be found on page 16 of this book. A Machine Gun Officer can thus ascertain that his men have reached the required standards, and also ensure that this standard is *maintained*.

RANK AND NAME.	REMARKS.
	To erect tripod and mount the gun on command "Mount Gun." Time: 20 secs.
	To load gun on the command "Load." Time: 5 secs.
	To adjust the sights and lay the gun on completion of the command "Range (object)." Time: 12 secs.
	To unload the gun on command "Unload." Time: 5 secs.
	To dismount gun on the command "Dismount Gun." Time: 15 secs.
	To bring the gun into action on the command "Action (Range (object)." Time: 40 secs.
	Horizontal traversing on the command "(Limits of traverse) Traversing Fire." Time: 3 secs. per series.
	Diagonal traversing on command "(Limits of traverse) Traversing Fire." Time: 4 secs per series.
	Rectifying stoppages. Time to begin correct action, 3 seconds.
	Belt Filling. Time: 25 rounds, 1 minute. Time: complete belt, 12 minutes.

CHAPTER II.

CHARACTERISTICS.

By characteristics of any weapon we mean the peculiarities appertaining to it, and we must have a grasp of these characteristics in order to understand properly the tactical employment of any weapon, and however well trained our M.G. Section are in the working of the gun mechanically, we shall fail in action unless we understand how to get the best out of it by handling it correctly in a tactical sense, that is, we shall not get the best value from the gun.

The machine gun has many characteristics, some in common with the rifle, and some with the artillery. Like the rifle, same calibre, same ammunition, same range. Like artillery, mounted on a fixed platform.

There are nine characteristics which we have to consider; some are advantageous and some the reverse, but the former outnumber the latter considerably.

Let us consider each in turn.

FIRST CHARACTERISTIC.

The most important of all the characteristics
—The fixed platform.

Not entirely fixed, as gun vibrates when firing.

From this characteristic we get—

(a) Reduction of the personal factor, resulting in less work being required of a tired and hungry man, than with a rifle, i.e., gun has not to be held in position by hand. If a man is unsteady through fatigue, gun is not affected, as long as the man remembers to keep his holding on the gun.

Results obtained from demonstrations in peace with machine guns can to a certain extent be relied on as a guide to results obtainable in war. The Continental Powers agree to this. This is not so with the rifle.

Germany divides peace rifle results by twenty.

It is difficult to say exactly what one ought to think about this. Only one man is firing the machine gun, whereas many different men are necessary to fire the rifles, and all have nerves to be considered.

(b) The result of thus practically getting rid of the personal factor is that you get close grouping of the shots.

One man, one barrel, one hold, as against many men, many barrels many and varied holds.

This close grouping, and therefore highly concentrated fire, is particularly suitable for surprise effect, and in the crisis of a fight, since the fixed platform is a nerveless thing, and the gun is therefore more reliable at a time when riflemen are likely to shoot wildly. Observation of fire is also easier, and more

reliable than with rifles, since owing to this close grouping, if, say, only the strike of one bullet is observed, we know that the others are pretty near it. This is not so with rifles, as the shot we are perhaps able to observe may be one from a man who is firing nowhere near where the majority of the rifle fire is going.

To be of use in the crisis of a fight the machine gun must be close up and ready to deliver a heavy fire when wanted.

Machine Gun Officers should bear this in mind.

With machine gun, depth of the effective or best 75 per cent of the beaten zone at 500 yards is 220 yard —Mark VII ammunition.

At 700 yards is 188 yards.

At 800 yards is 172 yards.

At 1,000 yards is 140 yards

At 1,500 yards is 70 yards.

With the rifle and Mark VII:

At 500 yards is 330 yards.

At 1,000 yards is 180 yards.

At 1,500 yards is 150 yards.

The rifle has the greater depth, and of course with tired or excited men this will be much increased, but this is not so with machine gun fire.

The width of the Effective Beaten Zone—
Machine Gun:—

At 500 yards Mark VII is 2 feet 6 inches.

At 1,000 yards Mark VII is 5 feet.

At 1,500 yards Mark VII is 10 feet.

The dispersion of the cones of fire must be also considered vertically through air, e.g., at 500 yards, the vertical diameter of the 100 per cent cone is 5 feet 5 inches $\times 2$, or 10 feet 10 inches.

At 700 yards is 7 feet 7 inches $\times 2$, or 15 feet 2 inches.

At 800 yards is 8 feet 8 inches $\times 2$, or 17 feet 4 inches.

At 1,000 yards is 25 feet.

At 1,500 yards is 40 feet.

From this we can see that if we fail to get observation of fire, the importance of ascertaining the correct range by other means is very great, since the beaten zone is so small. If we can get observation we ought to get the range very accurately.

When you do hit with a machine gun you hit hard, but you can miss to the same extent.

The cone of fire of the machine gun, being so different from that of the rifle, you can generally pick out your own cone of fire, if observation is possible, even though many rifles are firing at the same time. Again, owing to close grouping of the machine gun, the effect of the error of the day, wind, etc., must be carefully considered.

When range can be obtained accurately by instruments, *overhead covering fire is reliable*, and, under certain limitations, can be used with safety to support an advance or to increase the volume of fire, but with the rifle this type of fire can seldom be used owing to

the certainty of erratic shots, and therefore only when the friendly troops are in a defiladed zone.

The disadvantage of close grouping is that narrow or widely extended targets are unsuitable for machine guns, e.g., widely extended infantry or an opposing machine gun, but there will be occasions when these unsuitable targets will have to be engaged. Suitable targets are those which are deep and solid. But effect can be obtained by employment of several guns and with skilful fire, direction orders—that is, combined sights for depth, and different aiming marks for width, or by vertical searching and traversing.

(c) The fixed platform renders night firing possible, gun laid by day, useful on outposts, etc., good results can be obtained up to 800 yards.

SECOND CHARACTERISTIC.

Rapid production and application of a large volume of accurate fire.

E.g., gun can be loaded and laid ready for firing, and all that there remains to do is to press the double button or thumb piece.

You can apply fire quickly, because you can generally get observation.

As regards rapidity, you can fire at the rate of 500 rounds per minute (not 500 rounds in one minute), because after each burst of 20 rounds or so, the aim must be checked,

and gun re-laid before recommencing to fire.

Roughly 25 men are equal to one machine gun, if firing at the rate of 12 rounds per minute and gun firing about 300 rounds in the minute, relaying after each burst of fire.

The correct point of aim can be picked up more quickly and with greater accuracy than with a number of rifles, for the machine gun officer can often lay a gun himself, if there is any difficulty in indicating the point he wishes to fire at, and in any case he has only got to make one man per gun understand his wishes, instead of large numbers, as is the case with riflemen.

Owing to the above, machine guns are useful on outposts.

Allow more men to rest. Can command any required locality for any length of time and with probability of greater effect than riflemen.

This rapidity of production and application of fire assists greatly in surprise effect, which is one of the most important factors in war.

THIRD CHARACTERISTIC.

Narrow front and shallow depth from which a large volume of fire can be delivered.

Six square feet only required for gun and its Nos. 1 and 2. Only two riflemen could use their rifles properly in the same space.

Therefore from a narrow front you can produce a much greater fire than is the case with infantry, i.e., with gun firing 300 rounds per minute and two men each firing 12 rounds per minute, machine gun fires more than twelve times a greater volume. Hence from a tactical point of view the usefulness of machine guns in closed country and cramped positions is obvious.

Examples.—In villages, roads or defiles, etc., also as a flank defence, to enfilade hedges, walls or obstacles, from windows of houses, etc.

FOURTH CHARACTERISTIC.

The all-round traverse.

With Mark IV tripod, if properly set up, fire can be opened at once in any direction, the only movement required being that of the Nos. 1 and 2. Compare this with changing the direction of rifle fire. The change of front of the machine gun is much quicker and no more liable to enfilade fire when changed than before. Thus a sudden attack from a flank can be dealt with at once. This indicates the usefulness of machine guns on a flank, or in a detached post, or on a salient, and for engaging an enveloping attack by mounted or other troops.

Consider this all round traverse when taking up a position in attack or defence, and also when making cover or entrenchments; it may sometimes be necessary to sacrifice cover to field of fire.

If you suddenly have to open fire to a flank, to repel a flank attack or enveloping movement, you should consider whether your limbered wagons, which were probably quite under cover from your original front, will still be so under the new conditions that have arisen, and if possible warn the corporal in charge of the new danger, so that he may take any necessary action—you don't want your horses, etc., to get enfiladed and so render you immobile.

FIFTH CHARACTERISTIC.

Invulnerability.

A gun in position with its Nos. 1 and 2 is a very small object and offers a very small target, hence it is easy to conceal and therefore difficult to locate, and if located difficult to hit.

Invulnerability greatly depends on invisibility. A gun is also difficult to put out of action, since only two men are required to fire it, and these, if put out of action, can be at once replaced by the other numbers, who should be equally well trained.

Mount your gun with a view to concealment. If mounted in the lowest position, only 15 inches of cover required, and if in the highest position 30 inches are required. Always have as few men with the gun as possible.

You now have reserve sections trained in your regiments for replacing casualties.

Some regiments have even trained three sections.

Section officers often want to have their sergeant with them, to assist control, etc., but this is wrong; it makes more men near the guns, and moreover your sergeant should be keeping touch between you and the limbered wagons, and ready to take your place if you become a casualty.

This characteristic of invulnerability therefore enables machine guns to get close to the enemy, and thus give support in the crisis of a fight, as already mentioned. You should know how to move across country with the guns in such a way as to make the best use of cover, and also to simulate the movements of infantry, thus making it extremely difficult for the enemy to pick you out when moving from one position to another.

SIXTH CHARACTERISTIC.

Mobility.

Machine guns with tripod mounting can go anywhere that infantry can, and therefore can closely support infantry in any nature of country, and in enclosed country machine guns will sometimes take the place of artillery when the ranging power and mobility of that arm can no longer be used for close support. Remember that in other circumstances machine guns should never attempt to become artillery. Machine guns are mobile both on and off the battlefield. Their

transport is self-contained, i.e., you have all your equipment and some ammunition with you in the G. S. limbered wagons.

Machine guns are mobile with both cavalry and infantry, more mobile than infantry from the infantry point of view, and about the same as cavalry from their point of view. Moreover pack transport can go wherever horses can go.

As soon as guns are removed from pack transport or limbered wagons, they become less mobile than cavalry or infantry, as they have to be carried by hand, and men carrying them can only run a very short distance, and cannot advance by rushes on account of fatigue.

Guns should be carried in limbers as long as cover is available, then by hand, therefore limbers must be very carefully handled, and drivers taught the use of ground and cover. Limbers can move over good ground at a trot or even gallop, with a few men on the limbers, therefore, owing to their mobility, machine guns are very useful as a reserve of fire power in the defence for moving quickly to any threatened point. They can be used in a similar manner in the attack on occasions. Machine gunners should be impressed with the necessity of never deserting their guns under any circumstances. There are many instances in the Royal Artillery in which gunners have worked their guns until all have been shot down; for instance, at the

battle of Colenso. There is no reason why the last machine gunner should not continue to fire his gun.

SEVENTH CHARACTERISTIC.

Liability to accidental cessation of fire—an adverse characteristic.

Machine guns, like all mechanical instruments, are liable to get out of order.

Stoppages are classed as follows:

- (1) Avoidable.
- (2) Unavoidable.
- (3) Temporary.
- (4) Prolonged.

(1) These are due to carelessness on the part of the No. 1, and therefore should not occur, i.e., want of oil, badly filled belts, etc.

(2) Probably some minor breakage, such as a broken lock spring—easily and quickly remedied.

(3) "Immediate Action" will cure at once.

(4) One gun may be put out of action from some serious cause such as perforation of the water jacket from being hit, but the other guns of the section can continue to fire. This is a good reason for not splitting up the four guns of a section into more than two sub-sections: that is, guns should not be used singly, as a general rule.

Owing to the above, we see the necessity of high training. Care of the gun is essential, and belts must be carefully looked after.

Faults in feed are often due to the state of a belt. With due regard to the tactical requirements, the following should be looked to:—

- (a) Surprise effect.
- (b) Suitable targets.
- (c) Decisive action.

Machine guns fire too much as a rule; their fire should be reserved for the crisis of a fight.

EIGHTH CHARACTERISTIC.

Noise of firing—an adverse characteristic.

It is an unmistakable sound, but on the battlefield there are many other noises, rifle fire, gun fire, also wind and echo, which will to a great extent neutralize this, also the sound of the bullet striking the air called by the French "Claquement," which generally makes the sound of the firing appear to come from quite a different direction from that in which the gun really is.

Machine guns have been found easier to locate by sound, when in the infantry firing line, than when on the flank of the firing line.

In the firing line itself, anyhow, is a bad place, unless circumstances render this position necessary.

NINTH CHARACTERISTIC.

Steam—another adverse characteristic.

This will not always be present, and depends on the amount of firing being done. It can be minimized or obliterated by:—

- (a) Having alternative positions.
- (b) The timely use of condensers.
- (c) Careful use of ground and cover.

This question of steam should always be given consideration.

The water in the barrel casing has been known to boil before the end of the second belt of ammunition has been reached.

To sum up the results of these nine characteristics, remember the machine gun is particularly adapted to surprise effect.

Let us now see how these characteristics affect the principal uses of machine guns. Refrain from firing at unsuitable targets unless the situation demands it; think, "Shall I get value for my money?" In teaching others, bring out any characteristics as they occur, and say to yourself, whatever you are doing, "Am I going against the characteristics of the gun."

CHAPTER III.

AMPLIFIED NOTES ON PART I, TABLE
"C" (*applicable both to the Maxim and
Light Vickers*).

1. The whole of Part I is instructional, and no records need be kept other than the number of rounds expended.

2. The Section Officer should invariably be present when Part I is being fired by his section.

3. Since Part I is instructional, no time limit is imposed.

4. The Section Officer may repeat any practice he thinks necessary. He can save ammunition by reducing the number of rounds fired in any practice by a trained machine gunner who proves himself to be a thoroughly efficient firer.

5. In regiments and battalions, Part I should not be begun until men are thoroughly trained in Immediate Action and have passed the Tests of Elementary Training.

6. The Traversing clamp should always be "Sticky."

7. General points regarding *methods of instruction*:—

(a) The instructor should always watch the firer, order him to cease fire from time to time and examine the target from the gun

position. Having made any necessary criticism, the practice should be continued, and when it is finished further criticism should be made at the target.

(b) It is important that the firer should be taught self-reliance in Part I, and whenever the gun is fired. He should therefore be given the opportunity of carrying out the points before, during and after firing, as well as remedying any stoppages that may occur without any assistance. Only when he has failed to carry out any of these points, or has shown himself unable to deal with a stoppage, should the instructor remind or assist him.

(c) No. 2 should invariably hold up his hand to indicate that No. 1 is ready to fire, and should await the order or signal of the instructor or superintending officer before telling No. 1 to open fire.

8. *Points regarding Range Discipline*:—

(a) Never allow anyone in front of the bracket until guns are reported clear by No. 1.

(b) Before going to the target, the lock of the Maxim gun to be on the rear crosspiece. With the Light Vickers Gun the lock to be raised above the guides.

(c) The Ejector Tube of the Maxim gun to be cleared for instructional purposes and extra safety, before going to the target.

9. All points before, during and after firing must be carefully attended to, and no slackness must be allowed in any point of elementary training.

10. *Part I, Table "C."**Practice 1. Grouping 5 rounds.*

It should be remembered when criticizing a group that the first round is not reliable because, when it is fired, the barrel is not vibrating and therefore it bears an inconstant relation to the remainder of the group. This, however, is not always noticeable.

This practice teaches and shows the following :—

- (a) The condition of the barrel and tripod.
- (b) Any peculiarities of the mechanism.
- (c) The holding required for the gun.
- (d) The sighting of the gun.
- (e) The adjustment of the fusee spring

necessary to obtain the proper rate of fire.

Method of conducting the practice.

The instructor watches the firer to see if he holds correctly and presses the double button (thumb piece) without pushing the gun forward or pulling it off the mark.

Criticism.

The holding should be criticized both at the gun position and when at the target with reference to the group.

Practice 2. Single shot traversing.

From right to left, from left to right, or both, one after the other, at the discretion of the Section Officer, and provided there is sufficient ammunition. Single shot loading must be explained.

Method of conducting and criticism.

After two or three shots, stop the practice

and examine the target from the gun position. Criticize the strength of tap with reference to the lateral interval between shots, but ignore elevation because the practice is to teach the tapping and not application.

*Practice 3. Application.**Method of conducting and criticism.*

Watch the firer, but glance occasionally at the target and check the laying if considered necessary. There should be no unnecessary delay in loading, laying and firing. Practice 1 should guide the firer as to the elevation. At the target accurate laying and correct elevation should be points for criticism.

*Practice 4. Vertical searching.**Method of conducting and criticism.*

Stop the firer after two or three shots and criticize before continuing the practice. The shots should show no marked lateral dispersion, as this would probably be due to side pressure on the handles, perhaps caused by the firer keeping one hand on the wheel and pressing the double button (thumb piece) with the other.

Practice 5. Horizontal traversing.

Fire applied from observation; the tangent sight may with advantage be lowered. The firer should stop firing when the end of the traverse ordered has been reached. Remind the firer that the method of altering the slide to too slow for practical service traversing, and that in practice 5 he learns the quicker

method of using the wheel for slight corrections of elevation.

Criticism.

Each group should be of the correct volume, i.e., of five or six shots.

The firer should be discouraged from using the sights, as he should by this time be able to tap automatically and correctly.

At the target the following points should be discussed:—(a) Good application which includes the area of the group, the volume, and the correct elevation; (b) the spaces between groups.

Practice 6. Diagonal traversing.

The instructor should note carefully that the wheel is not turned the wrong way when starting a new elevation.

AMPLIFIED NOTES ON PART II, TABLE "C."

For details of the various practices and scoring points allotted in the Classification practices (Nos. 9, 10, 11 and 12), *vide* Musketry Regulations.

The importance of Part II, Table "C," cannot be insisted on too strongly. If the instructional practices of Part I have been explained thoroughly, and if plenty of time and trouble have been spent on them by the Section Officer, then full value will be got out of Part II.

In Part II the methods of conducting the practices should approach "service" conditions as nearly as possible. No assistance whatever should be given to the firers, and the time limits laid down should be strictly adhered to.

The valuable lessons which will be learned in Part II, if properly conducted, may be summarized as follows:—

The No. 1 will learn—

(1) The necessity of attending to the points before and during firing, e.g., the oiling of the gun on every possible opportunity, water, etc.

(2) The necessity of examining the ammunition belts to see they are properly filled, that the bullets are pushed home till they are just protruding beyond the long brass strips.

(3) The necessity of making sure that all the spare parts carried in the emergency case are actually at the gun position, e.g., spare lock, feedblock, spring balance, clearing plug, etc. That is to say, he will become familiar with the contents of his "emergency case" which always should be at the gun position.

(4) The need of speed and accuracy in performing "immediate action" because all the classification practices are fired under a time limit.

(5) How to obtain the range to a target by ranging fire, and then to adjust his sights quickly to the correct sighting elevation thus found (Practices 7 and 8).

(6) How to apply fire quickly to a target by observation (one of the chief duties of the firer), getting his fire on to the target by "turn of the wheel" without stopping to alter his sights (Practices 9 and 11).

(7) In Practices 10 and 12 the firer learns the practical value of the 2-inch tap, and also to observe his fire, if observation is possible, and if this is not possible, how to quickly check his aim and quickly relay his gun between bursts of fire.

As the gunner is firing under service conditions, he is allowed to tap back, if he gets to the end of the target within the time limit laid down and has not finished his 100 rounds of ammunition.

The No. 2 will learn—

(1) The absolute necessity of his watching the Section Officer and not the target. To impress this on the No. 2's, the Section Officer should occasionally signal the "Cease fire" during a practice, noting carefully, by stop watch, how much more time he must allow the No. 1 on re-opening fire again, e.g., in Practice 10, say he signals "Cease fire" after 25 seconds; on re-opening fire he would do so for another 25 seconds.

(2) How to carry out his duties of assistant firer properly, e.g., to attend to the proper feeding of the gun, to see that the belt box is in line with the feedblock, etc.

(3) How to assist the No. 1 in any "immediate action" that may be necessary.

Very strict discipline should be maintained at all times on the range, and no slackness of any kind allowed.

Practices 13 and 14 are very valuable and are clearly explained in the Musketry Regulations.

CHAPTER IV.

FIRE DIRECTION AND FIRE ORDERS.

Musketry Regulations, Chapter III, on the theory of the rifle, apply to the machine gun, but the theory requires to be modified in detail to suit the characteristics of the machine gun.

Machine gun fire is a special form of collective fire, and as in rifle collective fire; we deal with the position of the cone, so also in machine gun fire; but owing to the fixed platform characteristic, we know that our machine gun deductions will be more accurate than those from rifle cones, and that our peace results will be similar to those we ought to get in war.

The angle of elevation tables in pages 224 and 225, Musketry Regulations, do not concern the Section Officer much, but to understand the positions of the lamp used for night firing, and the theory of overhead fire, they are necessary, in addition to the further study of machine gun fire.

There are two different methods of machine gun fire:—

(a) Ranging fire;

(b) Rapid fire.

(a) *Ranging Fire*.—This is used for the purpose of getting observation, that is, to obtain the range from the strike of the bullet.

Before using this type of fire, consider:—

(1) Shall I give my position away, or lose surprise effect by using it?

(2) Is the nature of the ground such that I am likely to get observation?

If the ground at the target is unsuitable, you may be able to range on suitable ground such as a road or ploughed field near it.

Bursts of fire of about 20 rounds should be used. More than this would be a waste of ammunition, as if you fail to get observation with that amount you are not likely to get it with more. If you can get observation you overcome the error of the day. We will discuss the error of the day later.

(b) *Rapid Fire*.—Machine guns are tested at the factory for firing about 500 rounds per minute; a special long belt is used for this purpose to avoid having to change belts at the end of each 250 rounds, but the normal burst for rapid fire is from 20 to 30 rounds.

Correct holding, and being able to check one's aim at the end of a burst, is necessary if good results are to be obtained.

Use ranging fire first, followed by rapid fire. But ranging fire must not be used when surprise effect is required, or when you are using combined sights.

There are two main headings in Fire Direction.

(a) Error of the day.

(b) Allowance for errors in ranging by artificial dispersion in depth.

As regards (a). This is dealt with in Musketry Regulations on pp. 73, 74, 75. When dealing with a machine gun cone it is not of much account below 500 yards, but at 1,000 yards and over, the error of the day may make a difference of anything up to 100 or 150 yards, i.e., when cold weather and head winds are acting together, or the reverse, with heat and rear winds, but this error of the day is very important owing to the close grouping of the machine gun.

Regarding (b). Owing to *errors in ranging* and in estimating the error of the day, it becomes necessary to increase the depth of the beaten zone, more particularly at long ranges, if fire is to strike enemy at first opening.

The amount the beaten zone has to be increased depends upon:—

- (a) The permissible error.
- (b) The probable error.

The permissible error must not exceed half the depth of the effective beaten zone. By permissible error we mean the largest amount of error in estimating the range that we can afford to make and yet still hit the target with part of our effective beaten zone. We shall sometimes exceed our permissible error, and miss the target.

Mk. VII.

At 500 yards EBZ=220 yards, therefore $\frac{1}{2}$ depth EBZ=110 yards.

At 1,000 yards EBZ = 140 yards, therefore $\frac{1}{2}$ depth EBZ = 70 yards.

At 1,500 yards EBZ = 70 yards, therefore $\frac{1}{2}$ depth EBZ = 35 yards.

As regards the probable error; this depends on the means at our disposal for getting the range:—

We allow for—

Instruments a 5 per cent error.

Key Ranges (from range cards), 10 per cent error.

Judging Distance, 15 per cent error.

E.g.—at 1,000 yards we must allow for an error of 50 yards, 100 yards or 150 yards, according to which of the above methods we are using and our range may be over or under estimated.

Therefore, considering the permissible and probable errors together, it is often necessary with Mk. VII to increase the depth of the effective beaten zone.

Let us consider how this can be done; there are two methods:—

- (a) Combined sights.
- (b) Vertical searching.

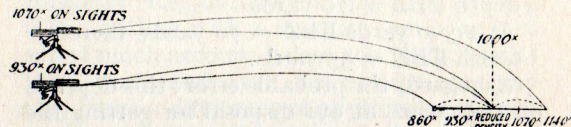
We will consider *combined sights* first.

When two or more guns are used together, the depth of the effective beaten zone is increased by using different elevations.

Result: the effective beaten zone is increased, but it is reduced in density.

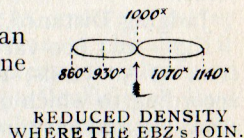
The extreme difference in elevations used, with no gaps, is the depth of the effective beaten zone for the range:—

MK. VII AT 1,000 YARDS.



The above is an example of extreme differences, and although there are no gaps we are getting reduced density where the two EBZ's join.

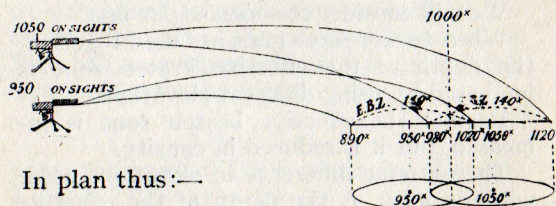
On the ground in plan our effective beaten zone would appear thus:—



To ensure getting even density it is necessary to make the EB. zones slightly overlap, and the greatest differences allowed in elevations are:—

With Mark VII 100 yards.

E.g.—Using 100 yards differences, Mark VII.



In plan thus:—

We get even density, having an overlap of 40 yards from 980 to 1,020.

With Mark VII—

At 500 yards the Effective Beaten Zone is 220 yards.

At 800 yards the Effective Beaten Zone is 170 yards.

At 1,000 yards the Effective Beaten Zone is 140 yards.

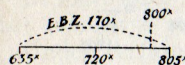
At 1,200 yards the Effective Beaten Zone is 110 yards.

At 1,500 yards the Effective Beaten Zone is 70 yards.

Assume a 10 per cent error at 800 yards, that is the real range to the target is 800 yards.

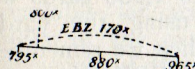
Range may be given you at either 720 yards or 880 yards, that is, over or underestimated by 80 yards.

If you open fire at 720 yards, or 80 yards short of correct range, you will get the following result:—



Target is just reached.

Or if you open fire at 880 yards, or 80 yards over the correct range, you will get this:—

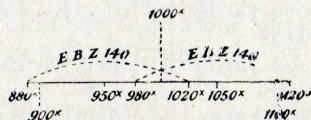


Target just hit.

The target is just hit in either case, therefore 800 yards has been placed as the starting limit (for guidance only) where combined

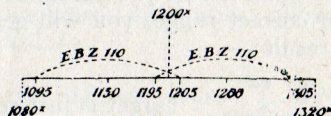
sights come into play. Therefore as a rule combined sights will not be used below 800 yards.

Example.—Range 1,000 yards. 10 per cent error gives either 900 yards or 1,100 yards—100 yards differences used.



We can cover the whole distance and get an overlap of 40 yards.

Example.—Range 1,200 yards. 10 per cent error gives either 1,320 or 1,080—100 yards differences used.

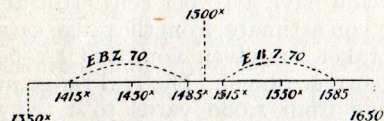


We can cover the whole (almost) distance and get an overlap of 10 yards.

Therefore certainly up to 1,200 yards we can get an overlap by using 100 yards differences. (Especially when we remember we have only taken the EBZ. into our calculations.)

Example.—Range 1,500 yards. 10 per

cent error gives either 1,350 or 1,650—100 yards differences used.



In this case we do not nearly cover the distance of our 10 per cent error, and neither do our zones overlap, they miss each other with a gap of 30 yards.

Consequently 100 yards differences are too great at this range, and 50 yards differences must be used.

From the above we get the following *general rule* on which to work:—

WITH MK. VII AMMUNITION.

At and beyond 800 yards and up to 1,200 yards inclusive, use 100 yards differences.

Beyond 1,200 yards, the differences should not exceed 50 yards.

Under certain conditions, a machine gun commander should use his judgment in modifying the application of this principle in accordance with the facilities that may be available for accurate ranging, e.g., reliability of the particular instrument in use, efficiency of the range taker, weather conditions, etc. The machine gun officer might be able to work on a 5 per cent error instead of a 10 per cent error.

Say you are using your guns grouped for a certain purpose.

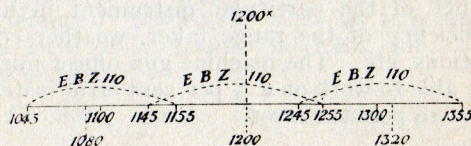
Say you have a 10 per cent error at 1,200 yards; you estimate, from the range card your range taker has given you, that 1,200 yards is the correct range. The real range may be anything from 1,080 yards to 1,320 yards, that is, you want to make sure of covering 240 yards in depth, with your effective beaten zone, and to do this you want to know how many of your guns you should use.

Say you decide on 100 yards differences with three guns. Will this do?

To find out.—(This method can be worked out when you have lots of time.)

Divide ground to be swept (i.e., twice the probable error for the range) by the difference in elevation allowed for the estimated range, and take the highest number, e.g., in this case, $240 \div 100 = 2\frac{1}{2}$ guns; you cannot use half a gun, therefore you take the highest number which would be three guns, which more than covers the required 240 yards. On the other hand two guns would not be enough.

Your order would be to the three guns you selected to fire: "1,100, 100 yards differences," and the result you would get would be:—



This is not absolutely correct, as under 1,200 yards your EBZ. increases, but for the sake of example it will suffice.

You have not got much density where the zones overlap, and if you think it is not sufficient volume to attain your purpose you could—

(a) Use six guns, each section using one elevation with same differences (100 yards) as above. You will search the same depth but you will double your volume.

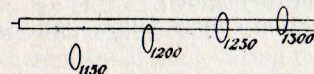
(b) Use five guns, 50 yards differences.

E.g.—Your sum would be $240 \div 50 = 4\frac{1}{2}$ guns, therefore use five.

Same amount of the depth searched, but you have saved the ammunition of one gun and you have still got good volume.

In cases where you wish to get surprise effect, the first consideration is to arrange to get your fire on the target at the opening of fire. The second consideration is to increase the volume of your fire.

On certain targets it may be advisable to sometimes use different points of aim, e.g., at a lineal target, such as a column of infantry



in fours crossing your front. If you have, say, four guns you would use combined sights and four different points of aim.

There are five reasons for using different points of aim:—

(1) Assists observation.

Perhaps one gunner will be able to obtain observation of his own fire and come up or down by turn of the wheel, and get the correct range for the other guns.

(2) You hit the target in more than one place.

(3) You distribute your fire.

(4) You have the same total volume of fire.

(5) Observation of fire is easier, since the cones are separated.

Example of fire order using combined sights, with 50 yards differences:—"1,150, 50 yards differences"—"Bridge over river."

No. 1 of No. 1 gun repeats.

No. 1 of No. 2 gun repeats, but says: "1,200 yards, 50 yards differences."

No. 2 gun may require 1,250 yards elevation for 1,200 yards, but he says 1,200 yards and sets his sights for 1,250 yards.

If you have grouped guns, and are working "by sections," No. 1 Section Officer repeats the order and both his No. 1's put the same elevation on their guns.

No. 2 Section Officer follows, and so on.

We will now deal with the second method of increasing our effective beaten zone in depth. This is called vertical searching. The principles of vertical searching are taught

in Practice 4, Part I, Table C, but only single shots are fired.

On service the range to the near end of the target, or ground to be searched in depth, is placed on the sights, and the gun is laid on the near end of the target, then, *without altering the elevation of the gun*, alter the sights to the range required to strike the far end of the target. Your line of sight will now be much below the near end of your target, but your gun will still be in such a position as to strike it; fire should now be opened, and after every burst of fire you elevate your gun by turn of the wheel sufficient to make each zone just overlap the one previous to it; you continue to do this until you find your sights come again on to your original aiming mark, i.e., the near end of the target. You will now have searched your whole target in depth, but if you wish to continue this searching, then alter your sights down again to the range, for the near end of the target, and search back again, over the old ground, until you find your sights come again on to your original aiming mark, i.e., the near end of your target; but when searching ground from the far end of the target down to the near end, you must depress the gun by turn of the wheel instead of elevating it.

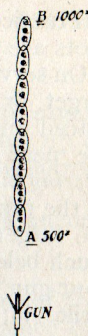
Example.—From A to B is a hedge. You wish to search from A to B.

Lay your gun on A with sights at 500.

Alter sights to 1,000 yards. Fire and

elevate alternately until your line of sight again comes on to A. Then reverse the process.

You would only use vertical searching in this manner when, for some reason, you had only one gun available, the other gun of your section being perhaps out of action temporarily; for if you had more than one gun, you could attain your object by the use of combined sights much more quickly and effectively.



LATERAL DISTRIBUTION.

Combined sights and vertical searching are the means available to increase the depth of the effective beaten zone.

The wind table—pages 223, 224, M.R.—must be studied and applied to overcome the error of the day in a lateral sense.

Fire can, however, be distributed in a lateral sense artificially in width, when the nature of the target demands it, by traversing fire.

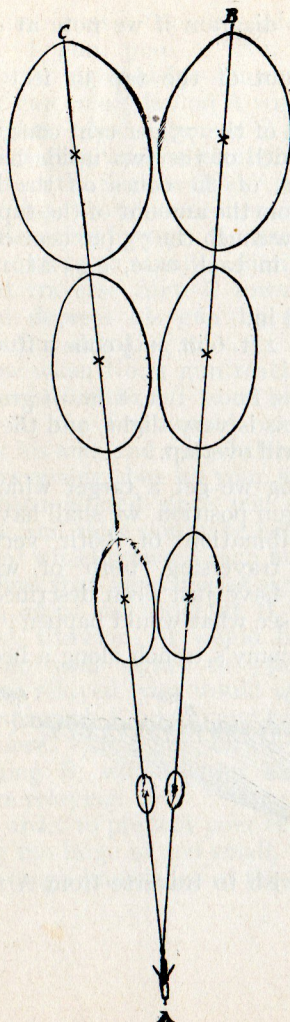
The 2-inch tap at 25 yards ensures the cones of fire just overlapping and leaving no gaps. It has been found by experiment that it requires about one belt of ammunition to traverse 50 yards of front in about one minute. This will act as a guide to Section Officers as to whether they are justified in engaging lateral targets of considerable width, with the guns at their disposal.

The following diagram illustrates the theory of the 2-inch tap:—

Width of
75 per cent
cone =
9 ft. 8 in.
at 1,500.

Width of
75 per cent
cone =
5 ft. at
1,000.

Width of
75 per cent
cone =
2 ft. 6 in.
at 500.



1,500 yards
from gun.
Tap becomes
10 ft.
Gap between
75 per cent
cones = 4 in.

1,000 yards
from gun.
Tap becomes
6 ft. 8 in.
Gap between
75 per cent
cones =
1 ft. 8 in.

500 yards from
gun. Tap becomes
3 ft. 4 in. Found
as follows:—
 $500 \div 25 = 20$.
2-inch tap $\times 20 =$
40 in. or 3 ft. 4 in.
Gap between
75 per cent cones
= 10 in.

25 yards from
gun.
Tap = 2 in.

In the above diagram if we note at each distance—

(a) The amount of the tap in feet and inches.

(b) The width of the 75 per cent cone, and subtract the width of the two inside halves (added together) of the cones on the lines A B and A C, from the amount of the tap, we shall find by how much the 75 per cent cones fail to overlap in each case, e.g., at 1,000 yards.

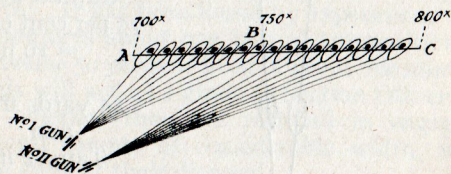
Tap = 6 ft. 8 in.

$\frac{1}{2}$ cone 5 ft. = 2 ft. 6 in. + $\frac{1}{2}$ cone 2 ft. 6 in. = 5 ft.

6 ft. 8 in. - 5 ft. = 1 ft. 8 in. of ground missed. But this is very slight, and the 100 per cent cones will overlap.

Now supposing we get a target which is oblique to our gun position, we shall have to employ a combination of both vertical searching and traversing, both of which methods of fire have just been described in detail. Let us see what would happen:—

Example.—Enemy's trench along a hedge.



Suppose we wish to traverse from A to C

with two guns. Our fire order would be:—
 "No. 1 gun, 700." "No. 2 gun, 800."
 "Quarter right hedge—Inward traversing."
 No. 1 gun would lay on A with 700 yards on his sights. No. 2 gun on C with 800 yards on his sights, and on receiving the signal to fire, from the Section Officer, No. 1 gun would commence to traverse towards B, tapping and elevating by turn of wheel between each burst of 8 to 10 rounds. Similarly No. 2 gun would traverse from C towards B, but he would depress his gun by turn of wheel, instead of elevating it.

Now when No. 1 gun reaches B, which is 50 yards further off from his gun position than A, the firer would naturally wish to check his aim, and relay before going on with his traversing, but as your sights have not yet been altered since you started at 700 yards, and since you have been elevating by turn of wheel between each burst of fire, you will find that your line of sight is now very much *above* the hedge at B, and before relaying, therefore, it would be necessary to put up your sights to 750 yards. Then having relayed, you would continue to traverse towards C by tap and turn of the wheel as before. No. 2 gun, on the other hand, on reaching B, would lower his sight to 750 before relaying.

In order to prevent your turn of the wheel being too large or too small, you must have a thorough knowledge of the correct turn to

give it. Practice 4, Table C, gives the recruit practice in the turn required for the overlap of cones at medium ranges, and therefore at the shorter ranges of say 400 yards, half the amount of turn is required, and at the longer ranges of say 1,300 yards an extra one-third of a turn would be required.

Again it must be borne in mind that when firing up hill against a steep slope, a much smaller turn of the wheel is required than when firing on level ground.

The application of vertical searching is constantly occurring when a machine gun is firing. Whenever ranging fire is applied the probabilities are that the gun will require some alteration in elevation, however small. Therefore, where quickness is essential, such as when surprise effect is desired, use the turn of the wheel for elevation, alterations of the sights by the slide being too slow.

NIGHT FIRING.

Occasions may arise on service when it would be very important to be able to bring machine gun fire at night on to some such target as a bridge, defile, ford of a river, or some obstacle in front of your position, such as wire entanglements, etc. This can be done with machine guns in the following way.

The gun must be mounted and laid by daylight, ready to fire at night, and although this is quite easy to do, it is necessary to have

some kind of auxiliary aiming mark for use at night, in order that the gun can be relaid should it work off its original line, due to the settling down of the tripod, loading, clearing a stoppage, etc.

Our auxiliary aiming mark takes the form of a night firing box into which can be fitted an ordinary siege candle lantern.

The first thing to do is to mount and lay the gun on the proposed defile, etc. Having done this, you can do no more during daylight except put a sentry over the gun to see that neither the gun nor tripod is moved in any way in the smallest degree. *After dark*, send someone out in front of the gun with a night firing box, which must be placed 10 yards in front of the gun and in line between the gun and the target. No. 1 at the gun can run up his tangent sight to enable his line of sight to run downwards on to the night firing box on the ground, and by this means align the centre of the box on to the target, but No. 1 must on no account whatever touch his elevating wheel. Having thus got direction, No. 1 now adjusts his *tangent sight* till his aim is on the centre cross lines on the box again by moving the tangent sight up or down, but without touching his elevating wheel. All is now ready to open fire, using the centre cross on the box as the aiming mark.

The reason for the box being 10 yards away is in order that the searching and

traversing lines on the box may be an accurate guide to the firer.

The horizontal lines on the box are 1 in. apart giving an angle of 10 minutes at 10 yards, and are for the purpose of vertical searching, hence it will depend on the range to the target how much ground in depth will be searched between these lines.

For example:—

For 600 yards the angle of elevation is 32.5 minutes.

For 400 yards the angle of elevation is 22.5 ft.—10 minutes difference.

If the range is 600 yards and the firer searches to the bottom line he will (on flat ground) search down to 400 yards, or 200 yards short of his target, and if he searches to the top line he will increase his elevation by 10 minutes or from 32.5 minutes to 42.5 minutes which is the angle for 750 yards, and so search 150 yards beyond his target.

By consulting the range tables on page 224 M.R., the effect of searching to the limits up and down at any range will be easily found.

Some searching is necessary at night to overcome any errors in aiming, holding, or other factors which might creep in, and cause faulty elevation.

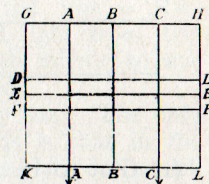
The flame coming out of the muzzle of the gun, and the dim light, both make it difficult to obtain a perfect aim.

It is also generally necessary to traverse at night; the amount will be governed by the

width of the target to be engaged, bridge, defile, etc. The outside vertical lines allow for this; they are each $2\frac{1}{2}$ inches from the centre line, and this at 10 yards gives approximately a lateral amount of 2 feet per 100 yards of the range you are firing at.

These lines can also be made use of for making any allowance for side winds which may be blowing at the time.

Diagram of the
Night Firing Box:—



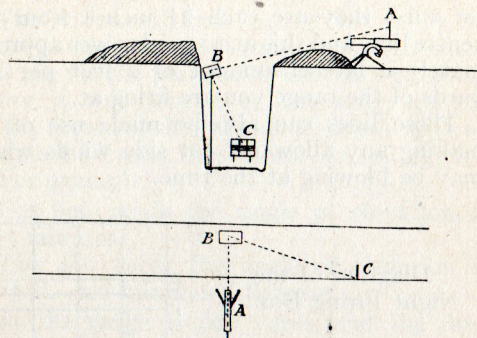
Dimensions of Night Firing Box.—Distance between lines are measured from centre to centre of each line. The lines being $\frac{1}{2}$ inch wide.

A—B	$2\frac{1}{2}$ inches.	E—F	1 inch.
B—C	$2\frac{1}{2}$ inches.	G—H	10 inches.
D—E	1 inch.	G—K	8 inches.

Note.—When laying the gun by day no allowance should be made for any wind which is blowing, since by nightfall it may have died down. If it has not, allowance can be made by the vertical lines as already explained.

This method of night firing with the box can also be used without placing the box 10 yards *in front* of the gun.

The method is as follows:—



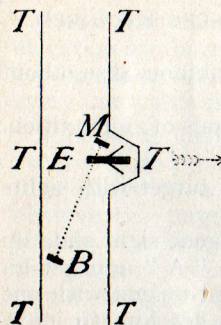
(1) Gun to be mounted and laid by day behind the parapet of a trench (a "trenchscope" can be used for this if available).

(2) Place a mirror at B below parapet of trench and in line between gun and target.

(3) Place night firing box in bottom of trench to the right or left of the mirror B at C, so that the total distance from A to C through B equals 10 yards.

(4) Move mirror about till night firing box is reflected to the eye of the gunner at A. The gunner then alters his tangent sight till he can use the reflected night firing box as his aiming mark.

A second mirror method, with a small mirror, which is now an article of issue, is as follows:—



TTT = Trench.

← = Gun.

→ = Direction of target.

E = Firer's eye.

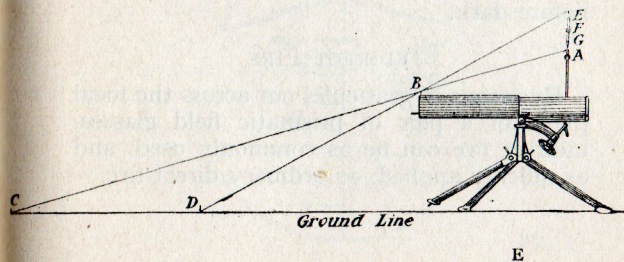
M = Small mirror on a post driven into ground near feed block.

B = Night firing box.

Dotted line = Reflected light from box through mirror to eye of firer.

Gun, as usual, is laid by day. The only difference to other methods is that in the centre of the mirror there is a black dot, which the firer looks at *through the V* of the tangent sight, and which he uses instead of the foresight of the gun when firing, and while aiming with this dot on to the centre of the night firing box, having first of all, of course, aligned the box and mirror correctly without moving the gun, which had been laid on the target carefully by day.

Another method of night firing is as follows. It is known as Captain Godsals' method.



GROUND LINE APPLIANCES REQUIRED.

C and D. Two small luminous discs about 1 inch diameter.

F and G. Two live rounds of ammunition.

Procedure:—

(1) Lay gun by day on target with sights set at correct range.

(2) After dark, run tangent sight slide up to its highest position at "A" and get an assistant to go out in front of gun with one small luminous disc, and get him to move the disc about till you get the sights A and B aligned on to disc at "C."

(3) Then take two ordinary live rounds of S.A. ammunition F and G and hold them as shown in diagram, get assistant to take another luminous disc D, and move it about till you get the line of sight E B aligned on D.

For firing at night use the line of sight A B C, but, having the two lines of sight A B C and E B D, we have got both direction and elevation, and this can be checked at any time, or the gun could even be mounted after dark, as long as the discs C and D have not been disturbed, and if they had been put out before dark.

INDIRECT FIRE.

By means of graticules cut across the focal plane of a pair of prismatic field glasses, indirect fire can be as commonly used, and as quickly applied, as ordinary direct fire.

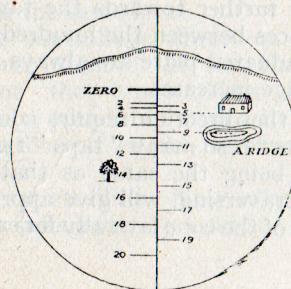
These graticules represent the angles of elevation for the gun. The topmost graticule represents zero, and the lines below represent every 100 yards upwards, from 200 yards.

Proceed as follows:—

(1) Obtain the range to the target.

(2) Move to a position whence you can observe the target through graticuled field glasses, look at the target in such a way that the graticule, representing the range to the target, falls across the target (*vide* diagram, e.g., 900 yards' line), then look for a suitable aiming mark above the target (which aiming mark must be visible from the position where the gun is mounted) and see which graticule falls across this aiming mark, e.g., the house, on the diagram, and the 500 yards graticule.

The range corresponding to this graticule, viz., 500 yards, is the tangent elevation at which to open fire, using the house as an aiming mark, in order to strike the target. By this means great accuracy is obtained while the gun and firer are invisible to the enemy.



This method becomes inaccurate when the eye of the officer using the graticuled glasses is more than 6 feet above the gun.

It is important to get an aiming mark vertically above the target making any necessary allowance for wind. If it is found necessary to increase or decrease the elevation after fire has been opened, since the position of the slide does not indicate the range to the target, another method other than the normal must be employed; there are roughly as many clicks on the ratchet of the tangent sight as there are hundreds of yards in the range, at all ranges below 1,500 yards.

For example, here we are using 500 yards on our sight, and the range to the target is 900, and we observe our cone what we judge to be 100 yards short of the target, the officer would order the firer to increase his elevation by 9 clicks, when he will find the elevation recorded on his sight to be 700 yards. If he had increased his elevation from 500 yards, which he had on, to 600 yards, he would not, over level ground, get his cone 100 yards further towards the target, since the distances between the hundreds of yards on the graduated plate are always increasing as the range increases.

Should the direction require correction, it is best to order so many "taps" right or left. The tap, being the same as that used for ordinary traversing, will give approximately one width of the cone laterally for each "tap."

If any difficulty is experienced in obtaining graticuled glasses the "Machine Gun Officer's Protractor" can be used. The No. 1 must make sure before opening fire that his bullets will clear the obstruction in front of him; he does this by looking through the barrel or by using a "reflector mirror."

INDIRECT FIRE.

Spirit Level Method.

With the aid of a carpenter's ordinary spirit level, Indirect Fire can be quickly and accurately applied with machine guns, to a target which is invisible to the firer, and, when there is no aiming mark, visible to the firer *above* the target. The conditions necessary for success with this method are:—

(a) The target must be visible to the controlling officer from a position behind, and slightly above the gun.

(b) The gun must be far enough away from the obstruction to ensure the bullets clearing it.

(c) The gun and the target must be approximately on the same level.

(d) The controlling officer, or the range-taker, must observe the fire through field glasses or the range-finding instrument respectively, preferably from a flank.

The method of employing this fire is as follows:—

(1) The controlling officer raises his head only just sufficiently to enable him to give

orders to the No. 1 as to aligning his gun on to the target for *direction* only.

(2) Having finished aligning the gun, as described in (1) above, the controlling officer now gives the following orders:—

(a) "Sights at zero."

(b) "Level gun with spirit level."

NOTE.—This is done with the Vickers or Maxim gun by laying the spirit level on the top of the breech casing (with the Lewis gun on the top of the barrel casing) and then by moving the elevating wheel until the bubble in the spirit level is central.

N.B.—If a spirit level is not available a plumb line can be used (a bit of string and a stone) held on top of the tangent sight, and the gun elevated or depressed by the elevating wheel until the plumb line hangs parallel to the tangent sight.

(c) "Place an aiming mark where sights are now pointing on near side of obstruction," for example, a stone or handkerchief, or anything No. 1 can see plainly.

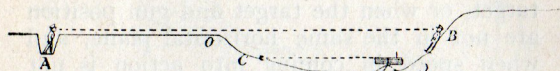
(d) "800" (or whatever the range to the target happens to be from the gun position).

(e) "Relay on aiming mark."

(f) "Fire" (or signal to fire)

Since the gun is now laid, with the correct angle of elevation for the range to the target on the sights, the bullets will now strike the target or in its vicinity.

Any necessary alterations in elevation, or in deflection, are made according to the results of the fire, which will be signalled in by the range-taker, observing the fire through his powerful instrument.



A = Target.

B = Controlling officer's head.

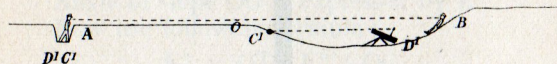
AB = Controlling officer's line of sight to target.

D = Gun, with sights at zero and levelled by spirit level.

C = Aiming mark put out by No. 2, under the direction of No. 1.

DC = No. 1's line of sight, with gun level and sights at zero.

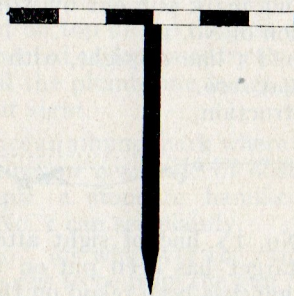
O = Obstruction.



D'C' = No. 1's line of sight after correct range to target has been put on the sights and after gun has been relaid on the original aiming mark at C; but the muzzle of the gun is now elevated at the correct angle to hit the target. Aligning pegs can be used with this method if target cannot be seen by section officer from behind the gun position, as described in the post and quadrant method.

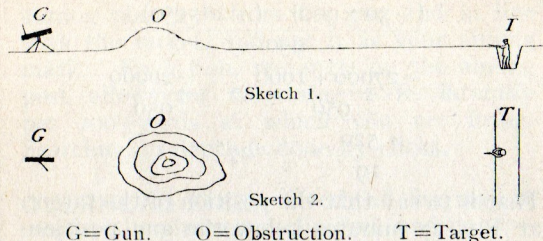
INDIRECT FIRE BY POST AND QUADRANT METHOD.

This method can be used when there is no rising ground behind the gun position from which the section officer can view the target, or when the target and gun position are not in the same horizontal plane, and when speed in coming into action is not required. The appliances required are (a) a machine gun clinometer Mark III and a hand clinometer, or an Abney level; (b) an aiming post 3 ft. high, with a cross-bar on top divided into six rectangles of 6 in. by 2 in. each (see sketch), the rectangles to be



black and white alternately; (c) four or five small aligning pegs.

To carry out this method of fire the following procedure is adopted (see Sketches 1 and 2):



The section officer crawls forward on to the obstruction O, and with his instrument finds the angle of slope from O to T and from O to G.

The range-taker also crawls up till he can just see T from O, and ascertains the range from O to T and from O to G, thus finding the total range from G to T by adding OT and OG together—call this GT.

Angle of slope OT is expressed by E° .

Angle of slope OG is expressed by E'° .

Now use following formula :—

$$\frac{E^\circ \times OT - E'^\circ \times OG}{GT}$$

Let us take an example :—

$$\text{Where } E^\circ = -30'$$

$$E'^\circ = -20'$$

$$OT = 900 \times$$

$$OG = 50 \times$$

and let us apply our formula, when the sum we shall get will be :

$$\begin{aligned}
 & (-30 \times 900) - (-20 \times 50) \\
 & \qquad \qquad \qquad 950 \\
 & = \frac{-27000 + 1000}{950} = \frac{-26000}{950} \\
 & = \frac{-520}{19} = -27'
 \end{aligned}$$

That is to say that the position of the target at T is 27 minutes below the gun position at G.

Now look up your angle of elevation tables for machine guns Mark VII ammunition, either on page 225 of your Musketry Regulations, or look at your machine gun protractor if you have one, and you will find that the angle for 950^\times is 59 minutes. Now, since the answer to our sum is *minus* 27 minutes, we subtract this from the angle for 950^\times , i.e. $59' - 27' = 32'$; this is the angle at which to open fire in this case to hit T.

Now align your gun on to the target by going on to the obstruction O, and driving in your aligning pegs to give you the *direction*, working back to the gun. Having got correct direction, take your Mark III clinometer or Abney level, set it to read $+32'$ and put it on the top of the breech casing if using a Maxim, or if a Vickers remove the lock and put the clinometer or level inside the breech casing so that it rests on the lock guides; then elevate or depress the gun until the bubble in the instrument is central; next put out your

aiming post 25^\times from the gun and in line with the target, and use it as your aiming mark. Each 6-in. rectangle on the aiming post allows for traversing 2 ft. laterally per 100 yards at which you are firing. Searching in depth is done by clicks.

OVERHEAD FIRE.—Overhead fire may be employed under certain limited conditions:—

The state of the barrel, the condition of the tripod, and the nature of the ground on which it is mounted, the visibility of the target, the error of the day, accuracy of aim, holding of the gun, are all factors which increase the difficulty and risk of employing overhead fire, and necessitate a reasonable margin of safety.

The flat trajectory necessarily restricts overhead fire at the closer ranges, if the gun position, friendly troops, and enemy are approximately in the same plane, while at long ranges the dispersion of the cone of fire and difficulty in ranging makes it dangerous.

Overhead fire might normally be employed under the following conditions:—

(a) Only *from* or *at* a commanding position, or across a valley; but *not* when the gun, friendly troops, and target are approximately in the same plane.

(b) The range to the target must be obtained accurately, that is, within 5 per cent of error, by a highly-trained range taker, using a range-finding instrument.

- (c) The No. 1 must be an expert firer.
 (d) Overhead fire should not be used over 1,500 yards.
 (e) If the range is 1,000 yards or under, and the lines of sight to the target and friendly troops contain an angle of not less than 30 minutes.
 (f) If the range is between 1,000 and 1,500 yards, the angle must not be less than 60 minutes.
 (g) These angles of 30 minutes and 60 minutes give a margin of safety of 15 per cent of the range at 1,000 and 1,500 yards respectively (5 per cent for errors in ranging and 10 per cent for other factors). At lesser ranges the margin of safety in each case continually increases.

The safety angles mentioned above may be obtained:—

(1) From prismatic field glasses graticuled for Mark VII ammunition, in which case the distance between the zero line and 600 yards graticules gives an angle of 32 minutes, and that between the zero line and 1,000 yards an angle of 63 minutes.

(2) *By the Card and String Method.*—Attach a piece of string of any convenient length, but the longer the better and not less than 24 inches, to a card. If the string is 24 inches long the angles required, viz., 30 and 60 minutes, are equivalent to the distance between lines drawn on the card, .21 inch and .42 inch apart respectively. If the string is

27 inches or 30 inches long, these spaces between lines should be .23 and .47 inch or .26 and .52 inch respectively.

By holding the card, on which these lines are drawn, vertically, and at the full length of the string from the eye, the space between the lines will give the required safety angles. The "Machine Gun Officer's Protractor" has these lines marked on it.

In diagram "A" the range to the enemy is between 1,000 and 1,500 yards. Consequently the safety angle of 60 minutes is taken. It is therefore safe to fire over the supported troops until the heads of the friendly troops touch the line of sight at "Z" (*vide* diagram "A").

(3) *By the Tangent Sight Method.*—Lay the gun on the target with the correct sighting elevation, then, if the elevation is under 900 yards, move up the slide 400 yards; if 900 yards or over, move up the slide 250 yards, and in each case adopt the new aiming mark thus found. In Diagram "B" the range to the target is 850 yards, hence the slide has been moved up to 1,250 yards, giving the new line of sight to "Z" at which spot No. 1 selects a new aiming.

If the controlling officer has a card and string, or protractor, a combination of the two methods should be used; the controlling officer, by using the card and string, can keep a check on the firer using the tangent sight method.

Note.—When using the tangent sight method of overhead fire, as soon as the friendly troops touch the firer's line of sight at Z, he will elevate by turn of the wheel on to the target, and can then continue to fire at the target until the heads of the friendly troops touch his line of sight on the target.

If the controlling officer is using the card and string method as a check on the firer, he will, when he sees the friendly troops approach the danger zone at "Z," give the following order: "Up by turn of wheel on to target."

When the conditions mentioned in (a) above are very marked, no difficulty in deciding when to elevate is to be anticipated, but as these conditions become less marked there may be some difficulty in deciding when the limitations of overhead fire are reached.

In such cases, when the command of the gun position or of the enemy's position is not clearly marked, the commander should not only act as explained in the "Note" above, but should also frequently place the lower line of the card or graticule, according to the range, on the heads of the friendly troops, and should order the firer to "go up by turn of wheel on to target" as soon as the upper line touches the enemy's position. (For Diagrams "A" and "B" *vide* end of this Chapter.)

FIRE ORDERS. MACHINE GUNS.

There are 4 guns in each battalion and 4 battalions in each brigade, making 16 guns in an infantry brigade.

These guns can be used either—

(a) Under the orders of the C.O. of the battalion to which they belong.

(a) Will be the method employed when a battalion is acting independently, or when the guns not being brigaded, no orders for the guns have been issued by the brigadier, or (if already brigaded for the march) the Brigadier directs them to accompany their battalions.

(b) Brigaded or grouped under the control of the brigade machine gun officer, who will take his orders from the brigadier.

(b) Will be used when the Brigadier considers it desirable.

Frequently a combination of the two methods will be advisable, i.e., some battalions have their guns with them, while the guns of the other battalions are brigaded under the B.M.G.O.

The following notes are suggested as a guide to regimental or brigade machine gun officers when giving fire orders, either to their own battalion sections or to Brigaded sections.

There are two chief methods of giving fire orders to machine gunners:—

(1) *When the Controlling Officer's voice can be heard by all the No. 1's.*—In which case the

controlling officer would issue his orders verbally direct to the No. 1's.

(2) *When the Controlling Officer's voice cannot be heard*, that is, he is too far away.—In this case he would either issue his orders by signal or by orderlies, or in the case of the guns being brigaded, either by orderlies or by the regimental M.G. Officers going to him for orders.

The main point to keep in view is the simultaneous opening of fire which can always be done by signals.

It will depend on the distance of the controlling officer from the guns as to whether he can issue the range to the No. 1's; very often he will have to leave this to his subordinates, being content himself to only indicate the target he wishes engaged. This can often be done by having defence range cards carefully made out, with accurate descriptions and ranges of hostile trenches or positions which it is thought probable will have to be engaged at some time or another; these hostile targets are numbered consecutively, and all the officer controlling the fire has to do is to signal the number of the target he wishes his gunners to fire at, and they know at once which he means and also the range to it from their own guns.

The two chief kinds of fire are:—

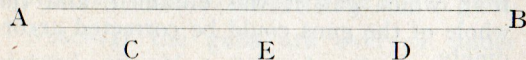
(a) "Concentrated Fire," or fire directed on to one aiming mark, either with one

elevation for all the guns, or by the use of combined sights, using 100 yards or 50 yards differences, the rules for which have been explained in this chapter.

(b) "Traversing Fire," or fire directed so as to sweep a line of hostile trenches, etc.

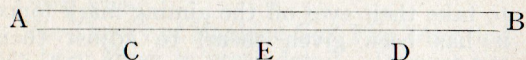
This fire can be used either traversing inwards from named outside limits, or outwards from the centre.

For example.—The four guns of a battalion traversing inwards:—



Enemy's trench, A to B.

The four guns would, having heard the outside limits named, automatically lay on A C D and B respectively. A traverses to C; C to E; B to D; and D to E; or for traversing outwards:—



Enemy's trench A to B.

The two centre guns would automatically lay on E, while the two outside guns lay on C and D respectively.

Guns would traverse outwards as follows:

E to C	C to A
E to D	D to B

By taking four points of aim we—

- (1) Distribute our fire.
- (2) Hit the target in four different places.
- (3) Have more chance of correcting our range by observation, since the cones of fire of each gun would be separate, and if observation is obtained it could be easily ascertained from which gun it was obtained, and the whole of the guns could be corrected accordingly.

If the Controlling Officer is in any doubt as to the range to the targets, he can use combined sights, differing by 50 or 100 yards according to rule, and alter to correct range from observation if this is obtained.

In a fire order it is advisable to give the range first, instead of the aiming mark. This ensures that the No. 1's will not have to take their eyes off the aiming mark (once it has been given them) to adjust their sights.

After the range, allow a pause for the No. 1's to repeat.

Then give the aiming mark, with suitable pauses to enable the No. 1's to repeat.

The elevation given by the Controlling

Officer is for the nearest gun to him, and is not necessarily the sighting elevation for the estimated range.

Example.—"900, one hundred yards differences" (pause until the No. 1's repeat).
"Bridge over river" (pause till the Nos. 1 repeat).

The No. 1 of the gun nearest the Controlling Officer (according to whether the latter is on the right or left flank of the guns) says, "900, one hundred yards differences." The next No. 1 says, "1,000, one hundred yards, differences," and so on down the line of guns.

Note.—If the guns are over or under sighted, the No. 1's make the necessary allowances for their own particular guns, but call out the range as ordered for their guns, and not the sighting elevation. Guns are loaded and laid on the target according to the above orders. As soon as the Controlling Officer sees all the Nos. 2's hands up, he looks at the target through his glasses, and, with his eyes on the target, gives the signal to "Open Fire."

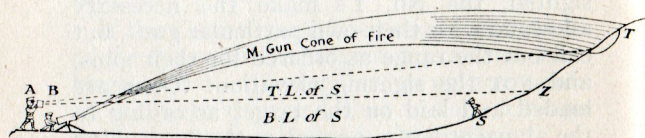
The Theory of Machine Gun Fire Direction has been given in great detail. It must not be considered for one moment that machine gun officers are in any way tied down to use one or other of these methods of fire. On the contrary, it will often be advisable to combine or modify the methods given. The whole object in view is to give out rapidly,

clear fire orders, to meet the existing situation; and as long as the orders given ensure that the target is engaged, so as to obtain the greatest moral and material results, it matters little what method is employed.

But the foregoing theory of Fire Direction will form a solid basis on which to work.

DIAGRAM "A."

CARD AND STRING METHOD.



T.=Target.

A.=Section Officer using card.

B.=No. 1.

T. L. of S.=Section Officer's top line of sight on to target

B. L. of S.=Section Officer's bottom line of sight on to bottom of safety angle at Z.

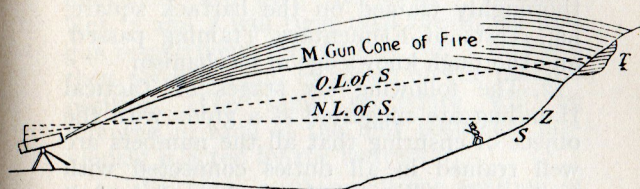
Z.=Commencement of Danger Area.

S.=Supported troops.

N.B.—Gun is laid on T with the *correct* sighting elevation for the range.

DIAGRAM "B."

TANGENT SIGHT METHOD.



T.=Target.

O. L. of S.=Original line of sight on target with correct elevation of gun.

N. L. of S.=New line of sight on to some spot on hillside below target, obtained by moving up slide of tangent sight, either 400 yards or 250 yards according to range.

S.=Supported troops.

CHAPTER V.

ELEMENTARY TRAINING IN TACTICAL
HANDLING.

1. The Section is supposed to have been thoroughly trained on the barrack square, i.e., Tests of Elementary Training passed, and thorough knowledge of mechanism.

2. The following six stages of Tactical Handling are suggested as a guide with the object of ensuring that all the numbers are well trained in all duties connected with tactical handling before they fire ball ammunition on the field firing area.

3. *First Stage*.—One gun, one ammunition box, belt with 50 dummy cartridges, Nos. 1, 2, and 3 only; remainder to watch and change round including the sergeant and corporal, so that all are exercised. The instructor will previously select suitable positions for the gun fulfilling the following requirements:—

- (a) Gun position on fairly level ground.
- (b) Gun firing down a steep slope.
- (c) Gun firing up a steep slope.
- (d) Gun firing horizontally along a steep slope, both to the right and to the left.

Nos. 1, 2 and 3 with the gun, tripod, and ammunition box will be in a position of readiness not more than 10 yards from the selected position. Having marked the

position with a stick or stone, and having pointed it out to the Nos., the instructor will give a definite situation and objective; also the approximate range, e.g., "The enemy has been seen collecting in that farm; lay on the gate; range 900." When the situation and objective are clearly understood the instructor will give the order "Action." Nos. 1 and 2 will then take the tripod and gun respectively, followed by No. 3, and will then place the gun in action on the marked position. The same procedure will be followed in each of the four positions, previously selected by the instructor.

In this stage neither will the position of the limbered wagon nor the question of concealment in approaching the gun position be considered, but particular attention will be paid to the following points:

(1) Correct setting up of the tripod, suitably and firmly, to obviate the necessity for re-adjustment.

(2) Position adopted by Nos. 1 and 2 so as to obtain the greatest fire effect while offering the least vulnerable target.

(3) Position of the ammunition box to ensure correct feeding.

(4) Position taken up by No. 3 so as to facilitate the supply of ammunition with the least exposure.

(5) That the gun is correctly "In Action," i.e., loaded, sighted and laid in accordance with the requirements of the situation. All

details of elementary training to be observed, e.g., crosshead upright traversing clamp "Sticky," cork plug out.

(6) That the gun is not fired, to emphasize the necessity, which will frequently occur on service, of coming into action ready to seize any opportunity that may occur, but not to fire unless the situation demands it.

Second Stage.—This stage will differ from the first stage only in the following respects:—

The position of readiness to be not closer than about 50 yards from the gun position. Instead of indicating the exact position on which the tripod will be set up, the instructor will mark two points about 30 yards apart, between which the gun will come into action. The frontages selected will exemplify the positions described in the first stage. Whenever possible there should only be one small portion of the indicated frontage from which the objective can be seen when the gun is in action. By this means N.C.O.'s and men will obtain practice in selecting suitable gun positions to meet the particular requirements of the situation, and thus develop an eye for ground. In this stage attention will be paid to the following points:—

(1) Use of ground to obtain the greatest concealment in approaching the gun position from the position of readiness. This should be kept in mind by the instructor when selecting the positions.

(2) Method of approach to the gun position

as regards carrying the gun, tripod and ammunition box. Concealment will be considered of greater importance than rapidity within reasonable limits.

(3) The six points already mentioned in the first stage. Observers should be sent out towards the direction of the objective to note visibility in the approach when the gun is being mounted and when in action.

Third Stage.—In this stage the entire section is exercised on the same progressive system as detachments in the first and second stages. The actual position of each gun will be marked by the instructor in order to bring out the handling of the section with reference to the ground and the requirements of the situation. All the numbers will be exercised in their particular duties, and these will be changed so that each N.C.O. and man may have practice in each duty. The general situation must necessarily be somewhat amplified in order to employ scouts and range takers in a realistic manner, e.g., the enemy have been observed collecting in the copse on the left front of the infantry; the section is covering the left flank. The guns are to be prepared to engage the enemy should he issue from the copse; our left is not protected. In this stage ranges will be actually taken. Whenever possible, the limbered wagon will be present or its position will be imagined, and the corporal will be in charge. Supply of ammunition will be actually carried out, e.g.,

boxes brought from the position or supposed position of the wagon, and empty belts will be passed back to be refilled; if the wagon is present the belt-filling machine should be in position for use. The points to be attended to in the first and second stages will be equally noted in this stage.

Fourth Stage.—When the first three stages have been thoroughly practised the selection of positions and the various methods of fire suitable to particular situations will now be introduced. A situation should be carefully prepared so that, if possible, there is one particular position that is the most suitable to meet the tactical situation while at the same time fulfilling as many of the requirements of a suitable machine gun position as possible. Again, the method of fire employed should be carefully criticized to ensure that the method most suitable to the occasion was employed, e.g., if the situation indicated traversing fire; perhaps to cover movement, concentrated fire at a particular point would obviously be inapplicable.

Opportunities should be taken during this stage for selecting and reconnoitring a defensive position. It may be assumed that the machine gun sections are held in reserve, and areas should be allotted within which positions should be reconnoitred. Some of the points to be criticized in such reconnaissance would be:—(1) The exact gun positions; (2) the best way to the position;

(3) ranges; (4) control and observation post; (5) that all information has been noted in such a manner as to be easily understood by an officer who has never seen the ground. Again, perhaps an outpost situation may be given; lay guns by day to cover certain approaches at night. In each case guns should actually come into action on the positions selected. N.C.O.'s should be practised in directing the fire in accordance with the prepared situation.

Fifth Stage.—This stage is the amplification of the last. In it surprise situations should be introduced necessitating quick change of target or change of position to evade artillery fire. The use of signals should also be practised both to control and regulate fire, as well as by sending out observing posts to signal results of supposed observation of fire.

Sixth Stage.—This is the final stage, viz., the training of the sections of a brigade in combined action. It should be carried out on a similar systematic method as the previous stages. Situations should be carefully prepared to bring out the particular principle it is desired to exemplify. Section Officers should be given opportunities of handling their sections in brigade.

(4) In all the foregoing exercises the tactical situations should invariably be prepared by an officer and should never be left to a N.C.O. An officer should always supervise and

criticize any exercise which involves questions of tactics. The ground should be as varied as possible, and many other positions should be practised than those mentioned, e.g., firing from ditches, use of isolated or continuous cover, methods of concealing the gun in action, and the personnel, i.e., cover from view both natural and artificial. The points noted in the first and second stages should be carefully attended to throughout.

(5) It is of the greatest importance that the situations, even in the first stage, should be carefully prepared on the ground beforehand, in order to obtain the best results.

Note.—In the third stage it is advisable to practise the men under instruction, somewhat as follows, in addition to the details suggested in the foregoing.

For example:—

(a) Tell the No. 1 of No. 1 gun that his firing pin is broken; see if he knows what to do on the spur of the moment.

Does he change his lock and pass it back to be repaired?

Was the spare lock at hand, at the gun position when required?

(b) Tell the No. 1 of No. 2 gun that his fuze chain is broken.

Was the spare fuze at hand?

(c) Tell the No. 1 of No. 1 gun that the lock he sent back for repair has not yet been sent back to him, but that his second lock

has also gone out of order—lock spring is broken.

What will he do? Does he try and mend it himself?

Does he think of asking the No. 1 of the other gun for his spare lock?

(d) Tell the Nos. 1 and 2 of No. 1 gun they are killed. Note what happens.

Were their places at once taken by Nos. 3 and 4? On the arrival of the new No. 1 (the old No. 3) did he search the ground near the gun, or the dead No. 1's body, for the spare parts which ought to be there? Was there any confusion?

(e) Tell the No. 1 of the No. 2 gun that his muzzle cup is broken. (Vickers' gun only.)

Did he tell No. 2 at once to slip off the outer casing of the muzzle attachment?

Did the No. 1 himself, at the same time, at once lighten the fuze spring down to about 3 lb., or act as described on page 92?

(f) Imagine further casualties to take place in the No. 1 gun team. How will they be replaced?

(g) Tell No. 1 of No. 2 gun that he is running short of water and oil.

Does he shout to No. 3 to fetch more? Does No. 3 know exactly where to find more water or oil in the limbered wagon?

(h) During this kind of work, occasionally give out fresh fire orders, and then as soon as you have signalled fire to be opened, spring some new situation on the firers, while their

mind is still intent on the last fire order received from you, e.g., tell the No. 1's they have got stoppages in the first position.

Do they clear the stoppages automatically, quickly and correctly?

(i) Finally, when you have thoroughly exercised your team as above described, and when you have reduced their numbers by imaginary casualties, say down to only two men of the No. 2 gun, signal "Out of Action."

Note what the two survivors do.

Do they withdraw their own gun and leave the other gun to be captured by the enemy? That is, do they forget all about it?

Do they try and carry both guns away and fail in the attempt by trying to do too much? Do they try and get assistance from neighbouring troops? or, failing this, do they take both guns off the tripods and get away? Of course the correct solution will depend on the situation.

CHAPTER VI.

USEFUL HINTS FOR MACHINE GUNNERS ON ACTIVE SERVICE.

Care and Cleaning.—Guns to be always kept clean and in perfect working order.

Before retiring to rest for the night:—

Nos. 1 tests the locks of their guns, and see also that the re-coiling portion works freely.

See that water jackets are filled.

See that oil receptacles in handles are full of oil.

Be sure that bore is clear. Reason—when in trenches insects, etc., crawl down bore, and result is a bulged barrel.

Belts (Filling of).—No. 1 sees that ammunition belts are properly filled, and the points of bullets are protruding just beyond long brass strips.

Belts (Repairing of).—If belt is badly worn, better to cut out worn part and join up the good pieces.

Belts (Cleaning of).—To clean a greasy belt: Soak for two hours in hot water. 1 part soda, decimal 3 parts soft soap, and 10 parts water. Having soaped them, scrub, dry and plug them.

Packing of barrels.—Never pack the packing gland or cannellure of the barrel with anything except asbestos packing.

Oiling of Guns.—Oil up your gun on every possible opportunity during pauses in firing, and change lock in order to clean and oil the one that has been in use for any length of time.

Contents of Spare Part Boxes, etc.—Be sure your whole team is thoroughly conversant with the contents of the spare part boxes.

Spare Parts.—When the guns are "In Action" be sure that the following spare parts are at the gun position:—Spare lock, Feed Block, Clearing Plug, Spring Balance, Fuzee and Chain (Combination tool—Vickers gun only).

In certain cases, apply to nearest detachment for necessary spare parts.

Sighting of Guns.—Owing to the fact that the sights on a Maxim or Vickers' gun are set five-eighths of an inch to the left of the barrel, it should be carefully noted that when firing on the 25 yards range in Part I, Table C, that the point of mean impact of each group of say 5 or 6 rounds should be five-eighths of an inch to the right of the figure aimed at. If the point of mean impact, or centre of each group, is found to be central above the figure or to the left, the foresight should be tapped over with a No. 3 punch until the gun shoots

five-eighths of an inch to the right. The lines of sight and axis of the barrel being parallel, the gun will theoretically shoot five-eighths of an inch right at all ranges, which is quite immaterial, but if the gun shoots central at 25 yards, the lines of sight and axis of the barrel will cross at 25 yards and will at 500 yards cause a lateral error of $12\frac{1}{2}$ inches, or about half the width of the effective beaten zone.

Elevating Gear Working Loose.—This is a fairly common occurrence and can be detected easily as follows:—

If very loose this will be quite obvious.

If, on the other hand, there is any doubt about it, and the No. 1 thinks his elevating gear is loose, he would ask the No. 2 to watch the wheel during a burst of fire, when, if the wheel is loose, and if the No. 1 maintains his proper holding on the gun, the wheel will be seen to rotate gradually during the firing, the result of course would be that the gun would be unintentionally elevated and the target would be missed, therefore this is a serious matter, and should be remedied at once by tightening up the "Bolt Jamming Elevating Gear," *vide (h)* Plate XXVI of the handbook 303 M. Guns, with the shifting spanner.

Stoppages.—If the points mentioned in the handbook of the Maxim or Vickers' guns,

which have to be attended to before and during firing are thoroughly and systematically attended to, stoppages will be of very rare occurrence and will be almost entirely eliminated.

Limbered Wagons.—All Machine Gunners should be thoroughly conversant with what these wagons contain.

Reserve Supplies of Water and Oil.—Care should be taken to ensure that the receptacles in the limbered wagons for the above are kept filled.

Condensers.—Affix condenser before there is any possibility of gun boiling.

Muzzle Attachments.—With the Vickers' gun, the muzzle attachment should always be used; weight of Fuzee Spring, about 9 lbs.

If Muzzle Cup breaks, lighten Fuzee Spring down to about 4 lbs., and remove outer casing of muzzle attachment; then remove broken muzzle cup, examine the outer casing of the muzzle attachment and, if undamaged, replace it, since, even without the muzzle cup, it will considerably assist the action of recoil. With the Maxim gun the muzzle attachment should be used (on service) if there is any likelihood of the gun not firing properly owing to excessive cold, etc. When the attachment is taken into use it is advisable to have the Fuzee Spring at slightly above the normal weight.

Precautions during Cold Weather.—In cold weather cover up guns and ammunition belts. (Belts can be kept from freezing stiff by putting them under the rugs of your transport animals against their warm bodies.)

Fifty per cent water and 20 to 50 per cent glycerine, according to degree of cold, is a good anti-freezing mixture to put in the water jackets. This mixture expands, so don't fill too full. In cold weather, more water can be obtained by melting snow. Oily belts quickly become stiff in winter; rub them pliant. Don't treat belts with glycerine.

Machine Gun Teams. To always keep in Training.—If not in the zone of operations, keep up the training of your team—Immediate Action, Tests of Elementary Training, Drill, etc. Very useful if machine gun sergeants take a few dummies out to the front with them in the spare part boxes. This advice has been taken by some section officers and found to be of the greatest value when training young gunners at the front.

Your No. 1 is responsible that the spare parts are at the gun position.

If the Nos. 1 and 2 are killed, the relieving numbers must remember to recover the spare parts on or near their bodies.

Meaning of the Term "In Action."—The term "In Action" means: guns in position,

mounted loaded, and laid, not necessarily firing.

Machine guns should nearly always be "in action," that is—ready to give support if required.

Meaning of the Term "Position of Readiness."—The term "Position of Readiness" means either (a) The guns mounted, loaded and laid, ready for firing, but with the gun numbers withdrawn under cover close at hand; or,

(b) The guns dismounted and under cover with the gun numbers, ready to be brought into action; or,

(c) The guns mounted just below the crest line, only requiring to be dragged into position when wanted.

Hints on Tactics of Guns.—Help of machine guns in the attack becomes essential just when the infantry attack is being pushed home.

Infantry action not to be guided by machine gun requirements, but machine gun action by infantry requirements.

Commanding or flank positions the best for machine guns.

Avoid prominent objects.

Look for dark backgrounds.

Selection of Positions.—Premature opening of fire to be avoided.

Use position of readiness until situation is clear.

Advisable to select machine gun positions with cover in rear to allow of the guns being withdrawn at any moment.

Formations During an Advance.—In moving across country when carrying the guns by hand, simulate the formations of the nearest infantry to you—if they are in small columns, move in small columns; if they are extended, do the same, unless you can find a covered approach.

Machine guns should be the "Ghosts" of the battlefield.

Quick Checking and Relaying of Aim.—Essential that all machine gunners should be able to quickly check their aim, and relay their gun after each burst of fire.

Co-operation with other Troops.—Machine gun officers must watch the movements of the troops with whom they are co-operating.

Opening of Fire.—Opening of fire to be simultaneous, to ensure surprise effect. Machine gun officers must ensure that all the No. 2's have their hands up before giving order to fire.

Machine gun officers must not stand up on the gun position whilst giving out their orders.

Reserve your fire for suitable targets, and the crisis of a fight.

Suitable targets are broad and deep, but engage unsuitable targets if situation demands it.

Bursts of Fire.—Bursts of fire should be anything from 6 to 20 rounds or even more, according to circumstances.

Bursts of 2 or 3 rounds are useless. The use of small bursts of fire is a very common fault among young machine gunners, and this tendency should be firmly repressed.

Traversing Fire.—A rough guide of traversing fire is that it takes one gun, one minute, and one belt (of 250 rounds) to traverse a front of 50 yards. You can traverse inwards or outwards, according to circumstances.

Duty of No. 2.—Impress particularly on your No. 2's that during fire, or when "in action," they must always watch the machine gun officer—very important—otherwise the M.G.O. cannot control the fire of his guns.

Reconnaissance.—During the preliminary reconnaissance, officers, sergeants, and range takers not to group at one spot.

Limbered Wagons.—Sufficient use to be made of them, to get the guns forward from

position to position, otherwise the gun numbers, in the later stages of the fight, will be too exhausted to efficiently work the guns. The nature of the ground will, if very open, restrict the use of the limbers.

Description Points.—For good results, to be as far away from gun positions as possible—often too close.

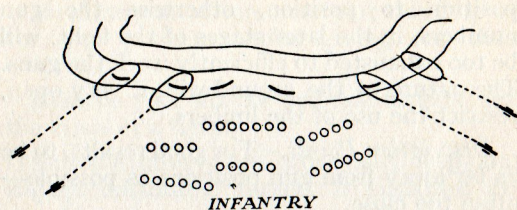
Machine Gun Signals.—Train your team to thoroughly understand these.

Range Finding.—Your team should know how to take ranges with instruments, and your No. 6's should know how to test and adjust their instruments.

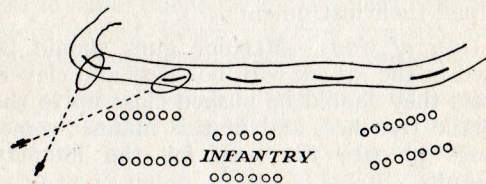
Uses of Guns.—Machine guns should be used in the attack with boldness and cleverness; they should be pushed close up to the hostile trenches, and in this manner sometimes prepare the way for the infantry assault.

Machine guns should be used against one or both flanks of the portion of the position it is intended to attack.

The closer the guns can approach a trench the more oblique becomes their fire. The duration and volume of the fire depend on the ground over which the advance of their own infantry has to be made, but they should be careful to husband their ammunition, as the ammunition supply is the chief difficulty to be overcome at close ranges.



Fire of guns can be crossed usefully, it makes them difficult to locate from the portion of the trenches opposite them, but without splitting up the section.



Close Support of Infantry.—Your chief duty is to closely support your own infantry; organize converging or flanking fire on the enemy's position. Do not be satisfied with frontal fire.

Surprise Effect.—Always try to obtain surprise effect.

When the advance of their own infantry has passed the machine guns, try to place the latter in position, whence they can assail the enemy as he retires from his trenches, or,

alternatively, in the event of a counter-attack, to open fire in such a way as to allow their own infantry to withdraw if this should be necessary.

Position in the Trenches.—It is essential to protect a machine gun from frontal fire, by means of a traverse. A machine gun in this position should not disclose itself too soon, but should wait till the enemy is nearing the trenches.

It is well to have spare sand bags at hand, so that cover may quickly be improved.

Sites for machine guns must be selected with the greatest care so as to give cross or flanking fire.

The emplacement must be concealed, and every effort must be made to ensure protection for the gun and detachment and surprise for the attackers. Try to conceal guns and firers from the view of hostile airmen.

Sites for frontal fire can only be used successfully in very exceptional circumstances.

The emplacements should be provided with overhead cover, wire netting protection against bombs, etc., with an easy ramp or steps as exit.

Alternative emplacements should be provided (in attack also).

In village fighting, machine guns are especially effective when placed in upper storeys of houses and in similar positions.

Machine guns are easily put out of action

by artillery fire, great care is therefore necessary in selecting machine gun positions, and in occupying them without attracting attention.

Outposts.—Machine guns are particularly useful on outposts, to command stretches of road, defiles or bridges.

Methods of ensuring timely warning of hostile approach during darkness:—

- (a) Specially active patrolling.
- (b) Pushing out posts, connected with telephones.
- (c) Illumination of foreground from time to time.
- (d) Absolute silence of defending troops.

Protect exposed guns by obstacles.

Beware of being surprised by a few highly trained snipers.

Crossing of Rivers.—Crossing rivers with machine guns:—

Where possible construct small footbridge.

Horses swim over below bridge.

Equipment ammunition, etc., carried across bridge.

Remove poles from limbers, attach ropes and traces, etc., if necessary, to wagons.

Make horses drag wagons across from far side, horses moving slowly at first to avoid breaking ropes, traces, etc.

If hay, straw or boards are available, ordinary rafts can be made with bivouac sheets used double if possible.

In first instance use shovels to paddle raft across.

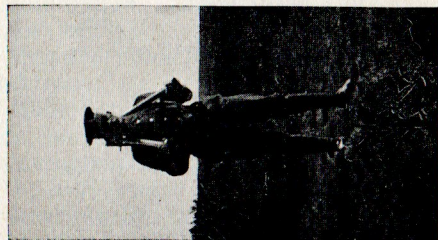
Even if horses and wagons cannot be got across, guns and ammunition can, by one man swimming across with a rope, which is picketed to each bank—remainder of men go across hanging on to rope hand over hand.

Guns are moved across by tying two ropes to them, one rope held on each bank. Water does not affect guns or ammunition, but S.A.A. boxes must be kept dry if possible.

Machine gun sections who are practised in crossing streams, may be able to achieve remarkable success if enemy has laid his plans on the assumption that a certain river is an impassible obstacle.

Empty Cases.—When possible, collect or bury these, to prevent them falling into the enemy's hands.

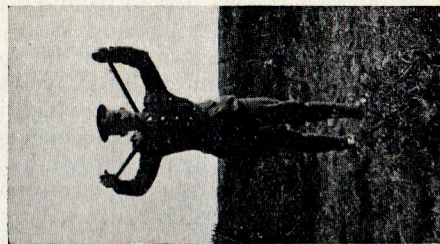
THE MOST COMFORTABLE METHOD OF CARRYING
THE MARK IV TRIPOD FOR A LONG DISTANCE.



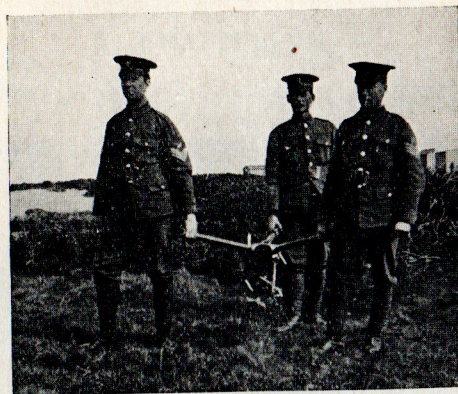
FRONT VIEW,
CORRECT.



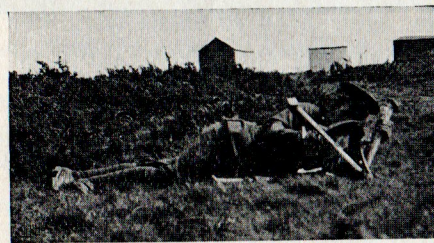
SIDE VIEW,
CORRECT.



INCORRECT
(VERY CONSPICUOUS).



THREE MEN CARRYING GUN AND TRIPOD
AS ABOVE CAN MOVE AT THE DOUBLE.



MOUNTING THE TRIPOD IN THE LYING
POSITION.



THE GUN AND NOS. 1 AND 2 IN
"A POSITION OF READINESS."

NOTE.—Gun could also be withdrawn below Ridge if desirable. One man must be posted as a Look-out Man.

CHAPTER VII.

INSTANCES OF SUCCESSFUL USE IN WAR.

I.

Prince Kanin at Sha Ho, October 12, 1904
(vide Diagram I).

This incident took place on the extreme Japanese right at the battle of Sha Ho, October 12, 1904.

Prince Kanin, with a brigade of cavalry of the 1st Army and six machine guns, was coming from Chao-tao. The Cossacks guarding the Russian left flank fell back to the East, and so allowed the Prince to arrive, within rifle range of a Russian camp, on the right bank of the Taitsu-ho.

Prince Kanin was not a man to let such a chance escape him. He pushed forward his machine guns stealthily to a ridge which commanded the river, and suddenly opened fire on the two battalions, whose men were quietly eating their dinners, at a range of about 1,500 yards.

In less than a minute hundreds of these poor devils were killed, and the rest fled in disorder in an easterly direction.

The machine guns at once changed their target and switched on to the Russian firing line, which was entrenched half-way down the slopes on the North side of the river, and

their whole attention was fixed on Penchiho. Before they could realize what was going on, they were riddled with bullets fired into them from the rear. Almost at once the two Russian Brigades, which formed the extreme left of Stakelberg's command, were in full retreat.

According to one account the machine guns had killed 1,000; and to another, 1,300. Stopped Stakelberg's offensive.

Fourteen battalions had been put to flight, and were probably useless for fighting purposes for that day.

Points.—Surprise produces big results.

II.

March 5, 1905. Okara's Brigade in difficult ground.

Six machine guns carried by hand under heavy infantry fire; three arrived at a position on some high ground behind firing line, whence they opened on Russian trenches at 1,000 yards. Japanese infantry able to progress.

Points.—Situation changed by action of machine guns.

III.

Mukden. March 14, 1905. Overhead Fire (vide Diagram II).

In attacking the hill East of Sy-ya-tun, the

machine guns greatly assisted the infantry. The positions of the machine guns (two at each place) are marked on the sketch by X X X.

The two left guns fired at 10 a.m. on a body of Russian infantry in close order at 1,800 yards.

The fire was then directed on the enemy's trenches, particularly at those marked "A" on the sketch, while the infantry gradually climbed up the steep slopes. At 11 a.m. when the Japanese infantry had got within 40 yards of the enemy's trenches, the machine guns had to cease fire. The Russians immediately stood up and poured so heavy a fire into their enemy that the latter had to fall back and take cover. The machine guns at once re-opened fire on "A," and a few minutes later the Japanese infantry rushed the trenches. These trenches were taken just as the machine guns had exhausted their ammunition, so they borrowed some more from the infantry and moved forward to "A." On arrival, the guns were posted by sections at Y Y Y, as the Russians had only fallen back a short distance, and were entrenching.

IV.

March 7, 1905. The village of Hantchoupu was taken by the Japanese.

The four battalions of the 9th and 10th

Russian Regiments made a counter-attack against the village. Formation was seven lines of skirmishers in rear of one another. The Japanese had organized cross machine gun fire and the battalion of the 9th Regiment lost all officers, and 28 only survived out of 800 men.

V.

Attack and capture of the village of Heikoutai, January 25, 1905. (Extract from a lecture delivered by the Russian Colonel Rantsow.)

"Suddenly our advance was interrupted by a sudden crackling of machine guns, which swept our thin skirmishing lines."

Colonel Rantsow then explained at length how he was unable to find out whence the fire of these "devils' watering pots" was coming.

"At the same time, in spite of our artillery fire, the enemy's musketry fire continued to increase in intensity and made more and more numerous victims.

"It was especially between 1,200 and 1,000 paces that our troops were most highly tried.

"On getting to 1,200 yards, the Lieut-Colonel was at last able to discover that the machine guns were firing from the window of a big Chinese stone house. He therefore

sent off two orderlies to the nearest battery to ask them to shell the house.

"Of these two orderlies, who ran with a hundred yards interval between them, one only arrived.

"The firing line, which could only make slow progress on account of the violence of the fire, was obliged to stop and lie down.

"A long wait ensued; at last one of our shells struck the house occupied by the Japanese machine guns, which at once ceased their fire.

"Immediately the battalion opened a rapid fire on the house, whose roof fell in amidst flames. It was then 4 p.m.

"The machine guns were not heard again during the fight."

This example shows us the Russians suffering greatly from machine gun fire through not being able to discover their position, but it also shows us the machine guns destroyed by the artillery, once their position was found out.

We may conclude that machine guns ought to act at effective range, by surprise, after having carefully studied the ground, and being concealed from the view of the enemy, and especially of his artillery.

VI.

Remarks from "Le Journal des Sciences Militaires." First Example. Operations in Manchuria, January 28, 1905.

The Russian artillery had run short of ammunition. The four machine guns of the Caucasian Brigade were called up. (These guns had been bought by the Colonels.)

They arrived just at the moment when the Japanese were executing the attack in thick lines. The enemy, taken completely un-awares, received the fire from the machine guns at short range, threw themselves down, and small bodies commenced to fall back.

Two or three times the Japanese tried to partly resume the offensive, but without success. The Cossacks held their ground, and the machine guns each time caused heavy losses in the ranks of the assailants.

VII.

Second Example.

In the valley of Liotoum, Sourine's machine gun company repulsed a night attack taking place at 200 or 300 paces, and during $1\frac{1}{2}$ minutes delivered so damaging a horizontal traverse that the Japanese officers were for a long time powerless to make their men recommence the assault.

When we think of the heavy loss which can be caused by machine guns over a restricted area in a very short period of time, we see that the influence which they exert on an enemy must be very great:

Nor must we forget that the bullets which

fail actually to hit, have also great moral effect if they go close to the enemy. They force him down under cover, disturb his aim, and thus enable our own infantry to fire more effectively.

A short quotation from the experiences of a Japanese officer may perhaps make this point clearer:—

“Officers and men were profoundly impressed by the power of machine guns. When an attack began, they waited for the crackle of their own machine guns with the same impatient expectation as that of a farmer for the first drops of rain in a dry and sultry summer. Everybody's spirits rose when the sound was heard; though nobody knew the actual effect, if any, which they were producing on the enemy, the opening of the machine guns was greeted with cheers; even the wounded rose to their feet and shouted ‘Banzai.’ I have often seen a situation completely alter on the first tap-tap of the Maxims.”

DIAGRAM No. I.

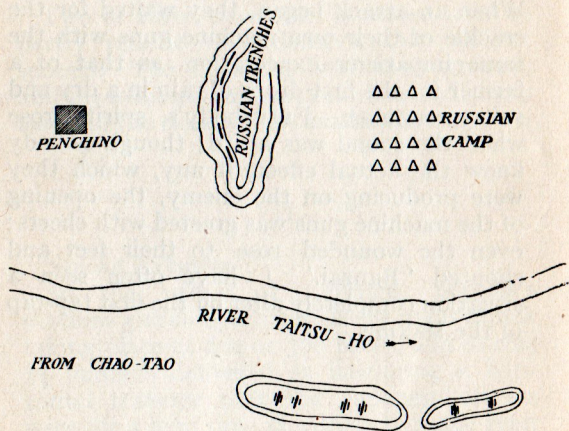
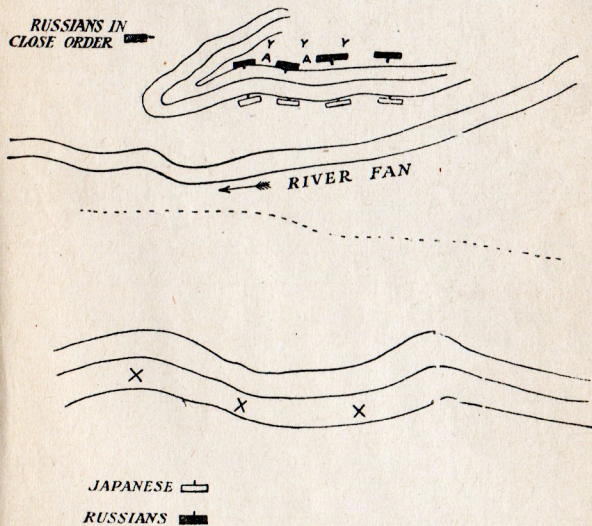
The Sha Ho, October 10, 1904.

DIAGRAM No. II.

Mukden, March 14, 1905.





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